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Table of Contents

Evaluating Training: What We Learned and Where We Are Going

Dr. Cathy Mingee and Brandi Taylor Pg. 8-19

Evaluating Enrichment Holistically Combining Activity Budgets And Item Evaluations

Allison Kao, Jason D. Wark Pg.20-23

Polar Bear Conservation Training At The Oregon Zoo...Let's Dive In!

Amy Hash, Amy Cutting, Nicole Nicassio, Jenny DeGroot, Robert Draughon and Sara Morgan Pg.24-28

Sexual Maturity Confirmation In Group Housed Female *Macaca Fascicularis*: A Team Collaboration

Angie Fontenot, Keely McGrew and Ashleigh Boyd.....Pg. 29-32

The Future Of Zoos, Through The Eyes Of A Dreamer

Steve Martin.....Pg. 33-39

Five Tools Of Building Resiliency In Ambassador Animals

LynnLee Schmidt.....Pg.40-45

The Husbandy In Healing A Galapagos Tortoise (*Chelonoides nigra*) After Leg Surgery

Lindsay Glass.....Pg.46-49

Using Behavioral And Physiological Data To Evaluate Animal Welfare In Marine Mammals: A Case Study On Polar Bears And Sea Otters

Nicole Nicassio-Hiskey, Candace Scarlata, Julie Christie, Amy Cutting, Jen DeGroot, Robert Draughon, Celess Edinger, Megan Hagedorn, Amy Hash, Renee Larison, Sara Morgan, Christina Parr, Michelle Schireman, Nadja Wielebnowski.....Pg. 50-62

Thinking Outside The Captive Wolf Management Box

Gaby Dufresne-Cyr.....Pg.63-68

On The Rebound: Rebuilding A Trust Account With A Brush-Tail Rock Wallaby

Jade Fountain.....Pg.69-70

From Glove To Exhibit: One Hawk's Flight To The Top

Victoria Karabanova, Leslie Storer, Kameron Thiele.....Pg.71-74

Making The Most of What You Have: Behavior And Welfare In An Evolving Context

Jake Belair.....Pg.75-77

How Our Zebra Earned Their Stripes

Jenyva Fox.....Pg.78-81

Training The Trainers: Getting More People Involved In Behavioral Management

Jennifer Diaz Pg.82-85

The Lone Wolf: Early Stages Of Wolf Eel Target Training

Shelly L. Pettit.....Pg.86-88

A Detailed Behavioral Approach to Rebuilding Confidence, Trust and A Postivie Relationship With A Sumatran Tiger (*Panthera tigris sumatrae*) Debra Marrin, Andrew Poole, Dr. Bethany Krebs and Kimberly McIntyre.....Pg.89-94

Working Together Through Operant Conditioning To Improve Animal Welfare For Orangutans In Borneo

Cydney Sines.....Pg.95-99

Talking Training: Evaluating Trainers And Giving Feedback

Nicki Boyd, Ellen Dreyer, Steve Martin.....Pg. 100-106

Enriching Ambassador Reptiles

Deidre J. Ousterhout.....Pg. 107-116

Back To Basics, Isn't Basic

Pieter Giljam.....Pg.117-118

An Eagle In The Closet, A Bobcat In The Bathroom and A Weasel In The Toilet: Our Evacuation Story From the Carr Fire

Sharon Clay.....Pg. 119-122

Take Better Care of Your Animals By Taking Care of Yourself

PJ Beaven.....Pg.123-128

Conservation Intent To Conservation Action: Maximizing Animal Ambassador Programs For Meaningful Environmental Impact

Nicolette Canzoneri.....Pg.129-133

“What’s App With That?” A Closer Look At How Technology Can Assist Us With Our Animal Goals

Scott Trauger Pg.134-139

Incredible Ibis

Karena Marrero Pg.140-142

Creating A Postive Reinforcement Training Program For Former Dancing Bears In India

M.E. Hampton.....Pg.143-146

Let’s Get Physical: Physcial Therapy And Exercise In The Geriatric Health Management Of A Herd Of Elephants

Laura Price.....Pg.147-149

Building A Behavioral Husbandry Program– Desert Style

Christine Montgomery.....Pg.150-153

Training For Euthanasia

Barbara Heidenreich.....Pg.154-157

Embrace The Bear: Utilizing Seasonality To Encourage Natural Behavior

Jessie McInelly Pg.158-161

How Changing From Stockmanship To Positive Reinforcement With One Steer Led To Multiple Positive Program Changes And Staff Skill Development

Elise Dubuisson, Debbie Marrin, Amy Phelps.....Pg.162-165

Behavioral Effects Of Classical Music On Shelter Dogs

J.Riha and S. Burk.....Pg.166-169

The Effect Of Grooming And Therapeutic Riding By Adolescents With Autism Spectrum Disorder On Equine Salivary Cortisol Concentrations

S. Burk, E. Kemeny, C. Gramlich, D. Hutchins and M. Shields.....Pg.170-174

ABMA Award List

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The Animal Behavior Management Alliance presents this award to

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In recognition of his distinguished service as President

2018-2019

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In recognition of her distinguished service as 1st Vice-President

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Tricia Dees

In recognition of her 3 years of exemplary service on the Board of Directors

2016-2019

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Missy Lamar

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In recognition of her contribution as a keynote speaker at the 19th Annual ABMA Conference

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Missy Lamar, Alicia Sampson, Jody Ambrose, Shannon College, Kristina Nelson

The Animal Behavior Management Alliance

Sharing the Knowledge Award:

Recognizes achievements in behavior management education to enhance the knowledge of professionals and/or the public to the benefit of animals in human care.

Barbara Hedenreich- Training For Euthanasia

The Animal Behavior Management Alliance

Animal Welfare Advancement Award:

Recognizes achievements that enhance animal welfare through specific environmental enrichment/conditioning techniques or programs.

Jessie McInelly- Embrace tThe Bear, Utilizing Seasonality to Encourage Natural Behaviour

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Behavior Management Innovation Award:

Recognizes outstanding application of novel, unusual, original behavior management techniques.

Lindsay Glass -The Husbandry in Healing a Galapagos Tortoise After Leg Surgery

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Behavior Management Achievement Award:

Recognizes an outstanding achievement in the application of behavior management techniques.

Mary Elizabeth Hampton - Creating a Positive Reinforcement Training Program For Former Dancing Bear in India.

The Animal Behavior Management Alliance

The Impact Award:

Chosen by the conference delegates, this recognizes the presentation, panel workshop, or event that impacted them the most from the whole conference.

Ken Ramirez

BMF SCHOLARSHIP WINNER

“Evaluating Training: What we learned and where we are going”

Dr. Cathy Mingee– Busch Gardens, Tampa
Brandi Taylor– Denver Zoo, Denver

It is widely accepted that positive reinforcement training with intermittent reinforcement is the best method for long term learning and behavioral success. What isn't widely accepted is what the 'best' implementation of intermittent, variable, reinforcement is. That is, what sort of reinforcement will lead to the best behavioral success – primary reinforcement, secondary reinforcement, occasional non-reinforcement or some combination of all of these? Literature on operant conditioning, positive reinforcement and clicker training are all easy to find, but few articles evaluate and discuss the implementation of these methods on learning, long term behavioral success and animal welfare in a data-based model. This study was designed to not only begin exploring these questions, but also allow us to truly evaluate our training program and interactions with our herd of Asian Elephants. The goal of our training program is to use a variable ratio schedule with a variety of reinforcement, but until now, we did not have any data to evaluate our program. Through extensive analysis, shared and discussed here, we were able to find out what our reinforcement schedules really look like and how our animals respond. Through a better understanding of our training practices, we have been able to improve our comprehension and implementation of the various reinforcement types available to us, understand how each individual animal responds, and thus, advance the care and welfare of our animals.

Operant conditioning has been used as an animal training technique for well over fifty years. The basis of the theory is that the frequency of behavior is influenced by consequences of that behavior. B.F. Skinner, who is credited with developing operant conditioning, identified four different consequences of behavior: positive reinforcement, negative reinforcement, positive punishment and negative punishment. In operant conditioning the word “positive” means to add, while “negative” means to remove and the word “reinforcement” means to increase the likelihood of the behavior occurring again while “punishment” decreases the likelihood of that behavior subsequently occurring. Thus, if a behavior is negatively reinforced the occurrence of the behavior increases due to the removal of some undesirable environmental experience. If a behavior is negatively punished that behavior decreases in the future due to the removal of something positive after the occurrence of the behavior. It is now commonly accepted that of the four conditioning consequences, positive reinforcement, or the addition of something pleasant at the completion of the behavior, is the most successful for long term behavioral success.

Although positive reinforcement is the ‘best’ of the conditioning consequences for successful training, it is not without potential drawback or fault. Positive reinforcement provides more opportunity for the subject to choose if and how they would like to participate. In the zoological and animal training community, this choice is becoming increasingly important as a way to help promote positive welfare experiences for the animals being cared for. Arguably, elephant training programs were among the last to adopt positive reinforcement as their sole way of training, with some facilities throughout both the United States and the rest of the world still relying on the ankus at various points. Researchers at Zoo Atlanta documented one aspect of their transition from free contact and more “negative reinforcement” to protected contact and positive reinforcement (Wilson, Perdue, Bloomsmith & Maple, 2015). The researchers monitored daily bath sessions over a period during 2001 - 2002 and determined that three ele-

phants refused requested behaviors far less often under free contact training than they did during protected contact training. In fact, the energy taxing behavior of laying down was refused by one elephant on every single request during all protected contact baths; the same individual refused only 14.3% of the time during free contact baths. The researchers suggest that even in the early days of protected contact training the animals recognized their ability to choose to participate and to exercise more control over their training sessions. While the ability to choose what to do is typically thought of as a piece of positive welfare by the zoological and animal training community, the researchers do point out that the ability to choose might have a significant negative impact on welfare due to animals choosing not to engage in specific training sessions such as husbandry procedures. Logically then, it is possible that some items thought to be positive reinforcement were not actually reinforcing for the elephants at Zoo Atlanta during the data collection as they did not increase the desired bath behaviors.

Reinforcement, by definition, increases the frequency of a given behavior but not every animal will find the same items reinforcing. Because of this, there are many different types of reinforcers that can, and should, be used when training animals. Typically, we split reinforcers into two categories: primary - items which are innately enjoyable, and secondary - items that animals have learned to enjoy. For animal training purposes, primary reinforcement is often a consumable item such as food that is reasonable quick to enjoy. Secondary reinforcement, sometimes called conditioned reinforcement, is much more complex to describe because different animals have developed a taste for, or have been trained to enjoy, different items and activities. Secondary reinforcers gain their reinforcing value through repeated pairings of a previously neutral stimulus and something that is already reinforcing. Some broad categories of secondary reinforcement are tactile or touch, environmental enrichment devices, play behaviors, verbal praise, and a bridge stimulus. A bridge stimulus is a marker to help pinpoint the moment in time that the desired behavior is completed and indicate reinforcement is on the way, essentially “bridging the gap” between the behavior and the delivery of reinforcement to the animal. A bridge can be anything that is both consistent in sound and unique or otherwise non-meaningful (i.e., not a word or signal that means something else) to the animal, but two common examples are clickers and whistles.

While the idea of a secondary reinforcer seems easy to understand and apply, it can be deceptively complex. One reason for the complexity is that secondary reinforcement is only secondary reinforcement if the reinforcing value comes from previous linking with another reinforcer. If the secondary reinforcer is actually innately enjoyed, for example, when an animal finds tactile enjoyable because it is satisfying and there is no other reinforcement paired with that tactile, then the reinforcer would actually be primary (Kuczaj & Xitco, 2002). Another piece that adds to the complexity is that secondary reinforcement can lose reinforcement value if it is not paired with primary reinforcement frequently enough or if the animal becomes satiated, which can occur with both primary and secondary reinforcement. Due to this, reinforcement value might fluctuate at any point in time, even during a single training session (Kuczaj & Xitco, 2002). Reinforcement value is largely subjective, not just due to satiation, but also due to other factors like individual preference. Secondary reinforcement is also influenced by the perceived value of the primary reinforcement it is being paired with, and the frequency of that pairing.

While most trainers agree that secondary reinforcement must be paired with something else reinforcing to stay reinforcing itself, one topic still up for debate is how often that pairing must occur in order for the secondary reinforcer to remain relevant to the subject being trained. It is important to note that by not pairing primary reinforcement with secondary reinforcement, extinction training is occurring, which will lead to the loss of value and the return of the secondary reinforcement to something close to neutral. Martin and Friedman (2011) outlined what they believe to be the most successful method of using secondary reinforcers through clicker training with animals and some of the problems they often see when observing trainers. The main problem they encountered is the lack of primary and secondary reinforcement being paired, something they termed ‘blazing clickers’. Martin and Friedman blame this lack of consistent pairing on a few common misconceptions about how secondary reinforcers work as training tools. These perceived misconceptions will be briefly outlined here, but see Martin and Friedman’s work for a complete review. First, some trainers believe that because the secondary reinforcer or ‘click’ is a reinforcer itself, it does not need to be followed by a primary reinforcer. Second, by not consistently pairing your secondary reinforcer with a primary reinforcer you are creating a more interesting training session. Third, the inconsistent pairing creates a variable schedule of reinforcement. Fourth, because the secondary/primary pairing is unpredictable, it will lead to less expectation of primary reinforcement, which can re-

duce unwanted aggression or frustration behaviors during a session. And fifth, the secondary reinforcement can be both a terminal and intermittent reinforcer, so it is ok to use it without primary reinforcement when you want to indicate the animal should keep doing what they are doing. The goal of the current research was not to fully explore these misconceptions or to evaluate the idea of ‘blazing clickers’. Instead, the goal was to evaluate how the Busch Gardens Tampa Bay elephant team used the different types of reinforcement and reinforcers they had available and to determine what, if any, impact on behavior these reinforcers had.

This project was designed to broadly evaluate the training program used by the elephant team at Busch Gardens Tampa Bay (BGTB). The philosophy of the elephant management and training staff at BGTB focuses heavily on positive welfare. To accomplish that goal, only positive reinforcement training techniques are used and an emphasis is placed on the elephants’ choice and control during all sessions. At no point is any negative reinforcement, negative punishment or positive punishment used with the elephants housed at BGTB. This includes consequences such as, but not limited to, time-outs, words such as ‘no’, ‘wrong’ or ‘bad’, the use of the ankus/bullhook/”guide” and any other force. Instead, the program uses a variety of reinforcement methods such as a whistle bridge, produce, tactile reinforcement delivered by hand or by scrub brushes, games and activities. These reinforcers are delivered based on the principle of VRRV – variable ratio with reinforcement variety. When an undesired behavior occurs, be it a natural behavior like a display of dominance or an “incorrect” answer, trainers remain neutral for a brief moment up to a few seconds, before re-engaging the animal. Once re-engaged the trainer might ask for the same behavior again or redirect with something different, or they might simply reinforce the animal for coming back to focus. Because the animal has the opportunity to be reinforced for staying with the training session, this moment of neutral response from the trainer is considered to be the “Least Reinforcing Scenario” or an LRS rather than a time-out, in which opportunity for reinforcement is removed. Although it is thought that the training being used offers a wide variety of not only reinforcement opportunity but also reinforcement variety that would encourage long-term positive learning outcomes, it really is not known if that was the case. The current research project aimed to create a large sample of training sessions that can be reviewed to determine if the program is accomplishing the training standards they have set for themselves and to determine if the training being used is accomplishing the goal of positive relationships and positive training interactions with the herd.

Methods:

Participants

Subjects were 1.3 Asian elephants (*Elephas maximus*) housed at Busch Gardens Tampa Bay (BGTB). All elephants had previous experience in a free-contact, negative reinforcement/positive punishment training program but all had been transitioned to a fully protected-contact, positive reinforcement training program by 2004. The four subjects ranged from 26 – 50 years at the time of the study, with the youngest two being born into zoological facilities while the older two were born in Asia and came to zoological facilities at young ages in 1972. During the period of data collection, June 23, 2017 – July 31, 2017, the bull elephant was in musth.

Nine different trainers worked the elephants during the training sessions of interest. Experience of trainers ranged from three to eleven years of positive reinforcement experience with any animal and two to ten years with the herd of elephants at BGTB. Some of that experience was not consecutive, with multiple trainers leaving the team temporarily to work with other species but returning to the elephants at some point prior to this study.

Management and Housing

All elephants at BGTB are housed in a protected contact barn and habitat. The habitat is circular, with no elephant access to the middle portion of the habitat, resulting in a ‘donut’ shape. Half of the circle is viewable only from the skyride, while the other half of the habitat is nearly all guest-facing. On the guest-facing side of the habitat there is a section of the habitat that has a large mesh interaction wall referred to as the Elephant Interaction Area, or EIA. This area of the habitat was designed to allow for husbandry procedures, as well as non-husbandry training and relationship building sessions, to be accomplished on the habitat in guest view as a way to demonstrate how we can safely work next to, but not in with, our elephant population. It is the only location on the habitat that allows for extremely up-close trainer & elephant interaction,

though other areas do allow for a minimal distance gap for activities such as feeding directly to the trunk. The habitat contains a pool, a hose waterfall, two drinkers, two shade structures, and various topographical features such as hills, natural shade, planted deadfall trees and dirt mounds for use as sleeping piles.

Data Collection

During the time of the study, there were two scheduled training sessions or keeper talks intended to introduce park guests to the elephants and the training techniques at 11:45am and 5:30pm, along with one enrichment shift where elephants were taken off habitat so that the habitat could be re-set before the elephants return at 2:30pm. While all sessions involved multiple trainers and trainer/elephant interaction, the most heavily staffed, and thus most in-depth training session, was the 11:45 interaction, so it was the sole focus of the data collection for this paper. Due to the shape and size of the habitat, it was decided that filming the sessions was the best option for the most thorough data collection possible. Sixteen different training sessions were recorded over a six-week period. Data was then coded by a single researcher to reduce discrepancy, though trainers more familiar with the team and program were consulted if the researcher was unsure of the appropriate coding. For each session every S^D , behavior offered and reinforcement given was recorded along with a variety of environmental variables that could be of interest such as which trainer and elephant(s) were working together.

A large dataset was created which contains information such as what S^D was given, if an additional S^D was provided, what behavior the animal offered and what sort of reinforcement, if any, was provided. Reinforcement was divided into three categories: primary, bridge and secondary. The bridge was separated from other types of secondary reinforcement as it was of special interest to the researchers. Secondary reinforcement was then further identified as verbal praise, tactile, additional S^D for a reinforcing behavior or other. When an elephant offered the desired behavior, that is, they responded correctly to the given S^D with appropriate criteria, that behavior was scored as “compliant”. Again, it must be noted that all behaviors were choice based and it was strictly up to the elephant to participate with no force or punishment being applied.

Results

Different elephants were asked a different number of behaviors throughout their sessions. In order to compare across subjects, the percentage of compliance was calculated for each of the four subjects. In all, the four subjects were compliant for 1,764 behaviors and non-compliant for 502 behaviors, resulting in 2,266 behaviors asked over the 16 training sessions and a 78% compliance overall. See Table 1.

Table 1. Behavioral compliance during training sessions

<i>Subject</i>	Compliant Behavior	Non-Compliant Behavior	Total Behaviors Asked	Percent Compliant
<i>C</i>	276	79	355	78%
<i>K</i>	706	160	866	82%
<i>S</i>	227	102	329	70%
<i>Sp</i>	555	161	716	78%
<i>Total</i>	1,764	502	2,266	78%

Because the main topic of interest was how different reinforcers impact behavior, the next thing that researchers looked at is the frequency of various reinforcers for compliant behaviors. There are three types of reinforcement resulting in seven different combinations, along with no reinforcement given, resulting in a possible eight different ways to reinforce a subject.

Primary reinforcement was delivered either by itself or as part of some combination of reinforcement on 51% of compliant behaviors. Secondary reinforcement was also extremely prevalent in the training sessions; a bridge was used as a reinforcer for 52% of compliant behaviors and secondary reinforcement of other types, excluding the bridge, was used as a reinforcer 32% of the time. When the bridge is considered part of the broader secondary reinforcement grouping, some form of secondary reinforcement was used with 87% of compliant behaviors. Trainers used their bridge and/or some other secondary reinforcer without primary reinforcement with 43% of compliant behaviors. See Table 2.

Table 2. Reinforcement type and usage

Reinforcement	Frequency of Use	Percent of Use
Bridge only	22	1%
Bridge and Primary	383	22%
Bridge and Secondary	195	11%
Bridge, Primary and Secondary	325	18%
Primary only	142	8%
Secondary only	557	32%
Primary and Secondary	54	3%
No Reinforcement	86	5%

Researchers next looked at the impact of the type of reinforcement delivered on subsequent behavior. First, researchers looked at compliance for any behavior following a successful behavior based on the reinforcement received for the first behavior. That is, if a subject correctly completed their “trunk up” behavior, the researcher looked at what sort of reinforcement they received and their compliance on the next behavior asked. Reinforcement with only a bridge was the lowest compliance rate on the subsequent behavior at 61%, where reinforcement with only primary was the highest compliance on the next behavior at 86%. See Table 3.

Table 3. Behavioral compliance on following behavior based on previous reinforcement type

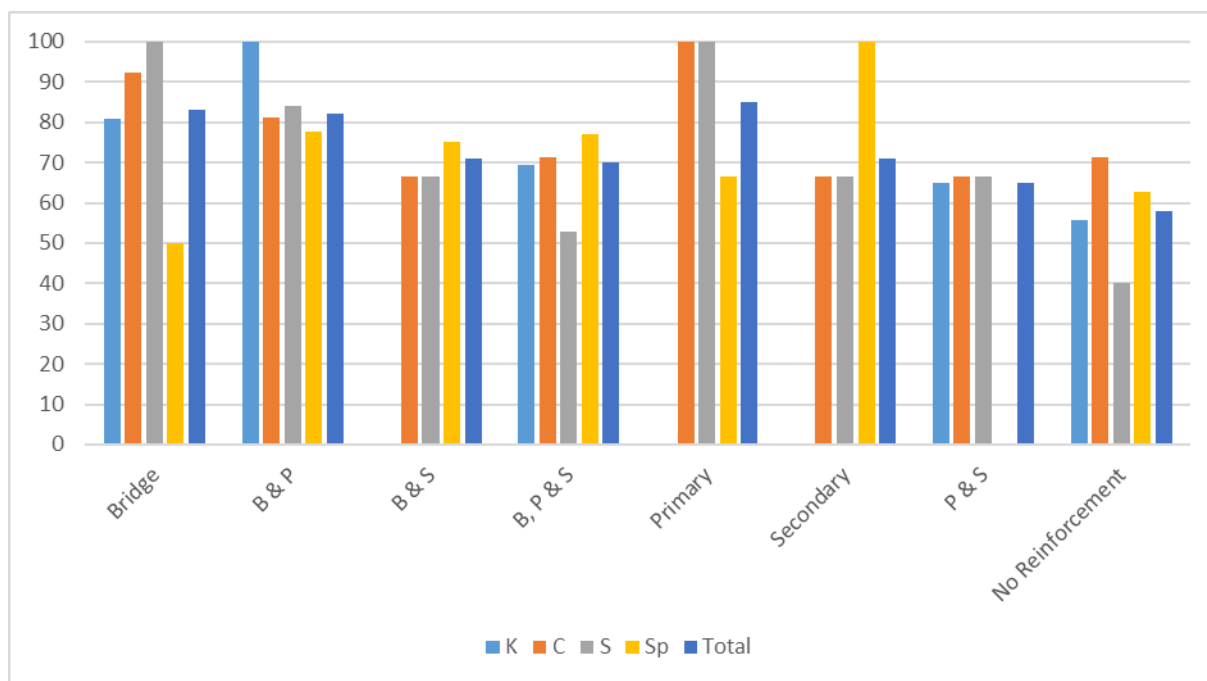
Reinforcement	Percent Compliant On Next Behavior
Bridge only	61%
Bridge and Primary	76%
Bridge and Secondary	79%
Bridge, Primary and Secondary	78%
Primary only	86%
Secondary only	72%
Primary and Secondary	80%
No Reinforcement	60%

Researchers next looked at a more specific example of this by tracking compliance of the subsequent ask of the same behavior. To do this the data had to be narrowed based on the following criteria: the behaviors must all occur in the same session (i.e., success on “trunk up” on day 2 was not tracked based on reinforcement from day 1), certain behaviors are part of a chain such as “pick up” and a variety of ways to manipulate the object the elephant was asked to retrieve, because retrieval and return behaviors must be paired, they were all excluded from this analysis. Some behaviors were naturally excluded because they were only asked once in a given session. Researchers were interested in the overall impact of reinforcement on the next attempt at the same behavior, so once a subject was successful with the behavior once in the session all subsequent attempts at the behavior were included, whether they were compliant or not. Overall, regardless of compliance and reinforcement provided on the prior attempt, repeated behaviors were compliant 71% of the time. When no reinforcement was given, subjects were compliant on the same behavior on the next ask 58% of the time. If only primary reinforcement was given, subjects were compliant 85% of the time the next time they were asked for the same behavior again. This data was split into individual subjects to address the potential of differences in individual response to reinforcement strategies. See Table 4 and Figure 1.

Table 4. Frequency of behavioral compliance for following same Behavior based on previous reinforcement type

	K	C	S	Sp	Total
Bridge	81	92	100	50	83
B & P	100	81	84	78	82
B & S		67	67	75	71
B, P & S	69	71	53	77	70
Primary		100	100	67	85
Secondary		67	67	100	71
P & S	65	67	67	0	65
No Reinforcement	56	71	40	63	58

Figure 1. Percent of behavioral compliance on following same behavior based on previous reinforcement type



Data was then combined to look at the compliance on the next attempt of the same behavior when a bridge had been delivered versus when it had not. See Figure 2

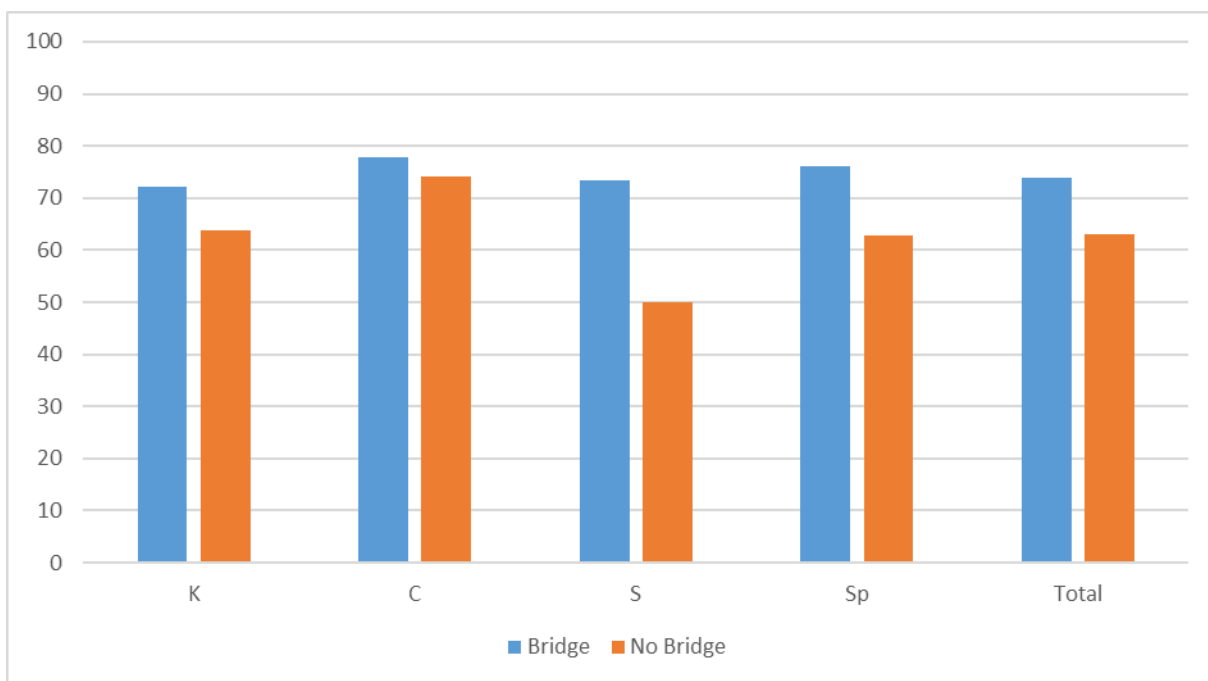


Figure 2. Percent of behavioral compliance for following same behavior based on previous presence of bridge reinforcement

Data was then combined to look at the compliance on the next attempt of the same behavior when primary reinforcement had been delivered versus when it had not. See Figure 3.

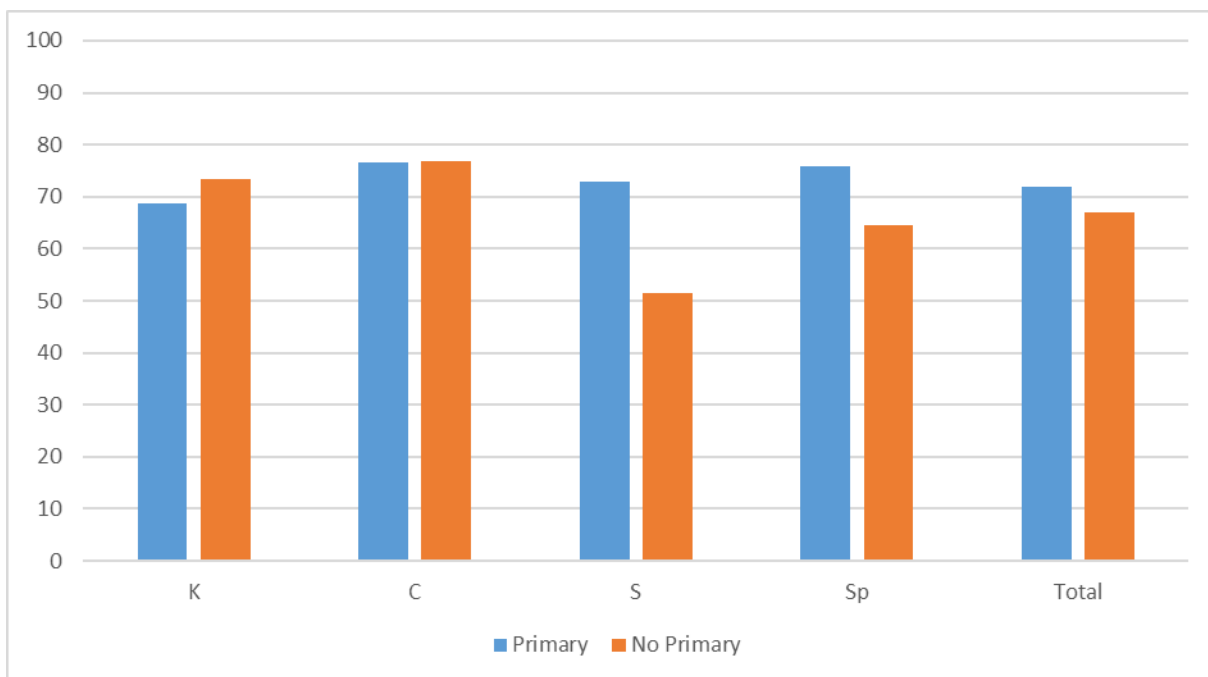


Figure 3. Percent of behavioral compliance for following same behavior based on previous presence of primary reinforcement

Discussion

The purpose of the current research was to evaluate the elephant training program at Busch Gardens Tampa Bay in a variety of ways. The initial idea was to gain insight into the training program to see if it was meeting the goals set out by the training team in terms of reinforcement variety both in type and schedule. Beyond that, it was determined that the data collected could help understand the use of secondary reinforcement and how it influences behavior. One of the big problems with reinforcement is that trainers cannot always be sure it is working in a given moment because they might not immediately see an increase in frequency of a specific behavior. Frequency of responding might increase in the future but if it does not then trainers were not reinforcing – the assumption is that things like food or a bridge are reinforcing but they might not be. By objectively evaluating what behaviors are being asked, animal compliance on behaviors and reinforcement given, along with other variables like trainer working the animal and social grouping of the herd, it is possible to learn about what the training program truly looks like and address areas that are less effective than the team would like to see.

Before data collection, the understanding of the BGTB elephant training team was that reinforcement was variable in both schedule and type. However, the data revealed that the elephants were worked with almost all continuous reinforcement, assuming both primary and secondary reinforcers, are meaningful to the herd. Although reinforcement itself was delivered on a predictable schedule, the type of reinforcement used was somewhat variable. All eight reinforcement combinations, including no reinforcement, were used at some point during the observed training sessions. The bridge by itself was the least common reinforcer used while some other form of secondary was the most common. One possible reason for this is because of how the elephant team has chosen to reinforce in a social group. When working with one trainer and one elephant, the team frequently uses their bridge to indicate correct behavior. When one trainer has multiple animals, the bridge is only used when all individuals are compliant. That is, if one trainer is holding three elephants and asks for a known behavior such as “trunk up” but only two elephants complete the behavior, those two elephants will receive some sort of reinforcement but no bridge will be sounded. The thought is that the bridge would be reinforcing to the animal that did not participate where other secondary or primary delivered to the other animals in proximity will not be reinforcing the non-compliance. A second reason that secondary reinforcement might have been delivered at a higher rate than other reinforcement is that due to social proximity on the habitat during sessions the team occasionally ‘holds their bridge’ or specifically works without their bridge so that they do not inadvertently reinforce at an inopportune time in a more critical session. For example, if a critical session of some sort, often learning a new behavior or husbandry, is occurring, the individuals working in close proximity will withhold bridges and work with only other secondary and primary reinforcement.

The current study indicated that different types of reinforcement were responded to differently, though some of the differences was negligible. Compliance on the next behavior was highest (86%) when only primary reinforcement had been delivered, but even no reinforcement, which had the lowest compliance rate on the next behavior, showed compliance at 60%, which is above chance. The bridge on its own had a compliance of 61% for the next behavior. When we focus only on the same, not any, next behavior compliance is found to be 71% overall and 83% compliant when only the bridge was used as reinforcement. Even with no reinforcement delivered compliance was 58%. If reinforcement scenario was divided into broad categories, anytime the reinforcement containing the bridge was used the next time the same behavior was asked animals were 74% compliant, and with no bridge they were only compliant 63% of the times. When those broad categories are based on the presence of primary reinforcement, the compliance on the same behavior asked again is 72% with primary reinforcement and 67% without it. All of these compliance rates suggest that there is some difference in how animals are responding to their specific reinforcement, but the relationship is not clear.

The bridge is a clear marker for the herd at BGTB. It is well responded to both on its own and when paired with other forms of reinforcement. Primary reinforcement is also well responded to, but there is minimal difference of compliance based on the presence of primary reinforcement. These factors suggest that the herd at BGTB has a strong reinforcement history with a wide variety of reinforcers and that there is not one single type of reinforcement that is more meaningful to them as a whole. It is possible that different subjects respond differently to reinforcement scenarios. One notable example of this is subject ‘Sp’ was compliant on the same behavior in the future 50% of the time when only a bridge was delivered on the previous occur-

rence. ‘Sp’ was the newest member of the herd, having only been at BGTB for around four years at the time of the study, so it is possible that the bridge did not have enough reinforcement history for him to fully recognize it as a reinforcer. When looking at individuals and their responses to different reinforcement types one other example is extremely notable. When primary reinforcement was present, two individuals showed lower compliance on the next occurrence of the same behavior than when it was not given as a reinforcer. It is possible then, that primary reinforcement was for some reason not reinforcing to these two individuals. One of them, ‘Sp’ was in musth during the study, which can decrease appetite, so it is possible that the lack of interest in primary reinforcement was a temporary status. It is also possible that the primary reinforcement being used was not reinforcing for other reasons such as individual preferences for the specific reinforcement being delivered. BGTB elephant trainers commonly use pears, apples and sweet potatoes as primary reinforcement with other produce used as magnitude items or for variety, so it is possible that a given individual did not find some of the produce as reinforcing and thus, were less compliant after the delivery of the less valuable or less enjoyable produce item. Another possible explanation is that the primary reinforcement was somehow distracting during the session due to the subject having to find it after it was delivered if it was not given directly to the individual, and then chew and ingest it. Perhaps certain individuals need more time between delivery and the next S^D than others. Overall, the data does suggest that reinforcement type is important, but perhaps there are other factors at play such as the relationship between trainer and animal or which specific behavior is being asked, for example. Another possibility is that no matter what reinforcement was given, a specific animal has a specific behavior that they will reliably do perhaps because it is self-reinforcing or because it is a very easy behavior for them, and that behavior is bound to be right at some point, resulting in occasional compliance.

The elephant program at BGTB has been fully protected contact and positive reinforcement for nearly 15 years, so the subjects of the study are all familiar with their ability to choose when and how they would like to participate. Based on the findings of Wilson, et al, (2015), there was a chance that the findings of the current work would show low participation, especially for energy taxing behaviors. In fact, there were no such findings. The elephants studied at BGTB were compliant 78% of the time. The compliance rate incorporates all behaviors, so it is possible that similarly to the Zoo Atlanta elephants in the Wilson, et al., study, the BGTB elephants were less likely to comply on more energy taxing behaviors, but that has not been fully investigated at this time. One other major piece of this finding could be the relationship strength of trainer and elephant together, something that was potentially limited in the Wilson, et al. study due to the newness of the transition. The findings of the current study can be further broken down to investigate the compliance for more or less energy demanding behaviors along with some form of relationship strength based on time working together at a later date.

Although the current study did produce some interesting and valuable results, it was not without fault. One major potential problem with the data collection is the potential for incorrect coding. This could have occurred for a few reasons such as a subject being out of view due to habitat design and placement of cameras, but it could have also occurred due to the atmosphere of the data collection location. BGTB is unlike many zoological facilities because it is a zoo within an amusement or theme park. The park has multiple roller coasters and other thrill rides that create a variety of mechanical noises along with guest reactions and also has music and announcements delivered over a park-wide speaker system. These environmental noises create the potential for some actions of the trainers or animals to be lost or miscoded due to volume of the recordings. Finally, to reduce inter-coder reliability concerns, only one researcher coded the interactions, but she was not fully familiar with the training program. Although she consulted the more familiar trainers for questions and clarity, it is possible that some data was miscoded due to human error.

Every training session is different and that was reflected in the sessions recorded for this study. Some of those differences, while natural, could influence the data and compliance rate. The researchers plan to study some of the differences in the future, however, it is not realistic to think that everything will be addressed. One such difference is animal compliance when they are working with a trainer one-on-one versus those occasions where there was one trainer and multiple elephants. The social dynamic of elephants suggests that different elephants might respond differently based on their proximity and comfort with other members of the herd. Another aspect of having one trainer working with multiple animals that cannot be fully addressed is that on occasion primary reinforcement intended for one animal was consumed by another. In those situations, it is possible that the animal that did not receive primary reinforcement might alter their behavior or stop engaging completely and it is also possible that undesirable or non-compliant behaviors were inadvertently reinforced which could change responding of the animal that self-

reinforced. In order to try to reduce both of these possibilities, trainers try to be aware of the social dynamic of the specific multiple elephants they are working with and try to keep them an appropriate distance or alter where reinforcement is being delivered so that it reaches its intended target. However, because reinforcement is often being thrown distances of 10 – 20 feet, it is not reasonable to expect trainers to maintain 100% accuracy.

The current project created a very large data set that the researchers hope to continue to explore in the future but it also spurs new questions. With the current data it might be possible to assess the relationship of trainer and specific animal by looking at individual success in a session based on compliance on specific behaviors. Researchers might also be able to look at the difference of ‘easy’ and ‘difficult’ or low and high energy behaviors and if compliance differed. The challenge with these topics is that they were not the initial concern when observing training sessions and thus, there is little or no control over how much data was collected for different trainer/animal pairings or how many taxing behaviors were asked by a given trainer or in a given session. Additionally, because the BGTB elephant team recognizes the importance of relationship building, not all trainers can ask for all behaviors, with newer trainers typically being limited to “easier” or less relationship taxing behaviors. Over time with the development of the relationship more behaviors are added to the trainer/animal pairing. Another challenge with categorizing behaviors is that not all elephants know the same behaviors and even those behaviors that overlap might be more or less difficult for a given individual. Although we might not be able to fully address differences in trainers or behaviors with the current data set, it is something that has been discussed as a future research project.

Another potential topic based on the current project is to study the value of specific reinforcers for specific animals. Because reinforcement is subjective and is technically only reinforcing if it increases the likelihood of behavior, it is easy to reason that if trainers are more sensitive to the differences in reinforcement value compliance rates might be influenced. At BGTB it is known that ‘K’ prefers sweeter produce compared to ‘S’ but both subjects receive all produce varieties. Nutritional balance is important, but it might be possible to work within boundaries to provide the most reinforcing items to each individual specifically and look for any changes in compliance. A second topic that is of interest is to more fully focus on the idea of ‘blazing clickers’ and to investigate the pairings and ratio strain of primary and secondary reinforcement pairings. The current study suggests that, at least for the elephants at BGTB, it is not necessary to pair every occurrence of the bridge or other secondary reinforcement with primary reinforcement. The elephants showed only a minimal increase of compliance on the next same behavior when primary reinforcement was provided. Two of the four subjects actually showed increased compliance when primary reinforcement was not delivered. It is possible that the reinforcement provided was thought to be secondary reinforcement by the trainers but is innately reinforcing to the individual subjects, or it is possible that a variety of reinforcement type, ratio and schedule, leads to increased compliance when compared to a continuous reinforcement schedule using a bridge and primary reinforcement pairing.

At the time of the current study, the elephant program at BGTB had been fully protected contact and positive reinforcement for 13 years. This exposure to only positive human interaction and the ability for the elephant to choose how to interact with no negative ramification has created what the training team thinks of as strong, positive, trusting relationships. Even husbandry behaviors are based on the relationship of the trainer and elephant, with no force applied. That means that there could be occasions where husbandry behaviors are not being completed due to a lack of compliance from the elephant. The physical health of an animal is important to their well-being and welfare. Maintaining a husbandry program that allows for day-to-day care as well as routine husbandry and medical procedures is a critical aspect of housing animals in a zoological facility. The current project has minimal data on success with husbandry behaviors, but a larger scale project investigating only husbandry behaviors and elephant engagement and compliance should be completed in the future to verify that all necessary husbandry is being accomplished, and that it is being accomplished by choice of the elephant.

The relationship between trainers and animals is not something that should be taken for granted. Over time the relationship can change in any number of ways. With no effort to maintain the relationship it might decrease in strength resulting in less interest in interaction and compliance when interaction is occurring. With continued effort, the relationship can continue to grow and develop. By having a strong, healthy relationship the goal is for the animal to exercise their right to choose but still choosing to interact. Wilson, et al., (2015) point out that choice might lead to decreased welfare, at least in the case of elephants transitioning into protected contact programs. Compliance at BGTB was 78% at the time of the current project. That number reflects compliance for each instance of a behavior being asked, so while a behavior might not have been

successful on every attempt, it does not mean that it was not accomplished in the end. 78% compliance means that the elephants at BGTB were choosing to participate, and sometimes they chose not to participate the way the trainers asked. By studying the different aspects of how the elephants were reinforced the training team knows more about their daily interactions and how those interactions can impact the behavior of each specific animal.

A typical compliance rate of 78% means different things to different people. It might mean that the elephant program is not as successful as they hoped. But it might also mean that it is more successful. A focus on positive welfare means a focus on animal choice and control. With a compliance rate of 78% some training programs might ask themselves “how can we raise that number?” Others might ask “do we need to raise that number?” Is welfare lower because animals are occasionally choosing to skip their husbandry? Or is welfare higher because animals are exercising their right to choose and control?

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Evaluating Enrichment Holistically Combining Activity Budgets and Item Evaluations

Allison Kao¹, Jason D. Wark¹
¹Lincoln Park Zoo, Chicago IL

Environment enrichment is a core component of animal husbandry programs but evaluating the efficacy of enrichment has proven challenging. Currently, many zoos assess enrichment based on an animals' interaction with enrichment items, often using a qualitative rating scale. Although systematic, these ratings have several limitations as they are often subjective, based on indirect evidence, and too narrow to comprehensively evaluate enrichment that may target multiple behavior goals. At Lincoln Park Zoo, animal husbandry managers are developing a three-tier evaluation process to gain a better understanding of the benefits and needed improvements to species-specific enrichment programs. The tiers include keeper records, enrichment object evaluation, and evaluation of activity budget goals for a species. Goals are being established for six-standardized behavior categories (Inactive, Feed/Forage/Drink, Locomotion, Undesirable, Other Solitary, Social) using previous data and published reports of zoo or free-ranging populations as a guide. The ZooMonitor app is aiding in gathering and compiling the data needed to assess the program in a holistic manor. These results are guiding modifications of the enrichment and management plans, allowing us to continually evaluate and enhance enrichment programs per species and individuals.

Environmental enrichment is a core component of animal husbandry programs but evaluating the efficacy of enrichment has proven to be a challenge. Currently, many zoos assess enrichment based on an animals' interaction with enrichment items, often using a qualitative rating scale. Although systematic, these ratings have several limitations as they are often subjective, based on indirect evidence, and too narrow to comprehensively evaluate enrichment that may target multiple behavior goals. In addition, enrichment goals tend to be based off of broad enrichment categories such as sensory, food/feeding, environmental, manipulative items/toys, and social.

At Lincoln Park Zoo, like many other accredited zoos, we are committed to promoting great welfare for our animals and to accomplish this, we strive to provide a dynamic and rewarding experience for them. However, simply providing these opportunities is not enough and a greater emphasis is needed on the evaluation process. We are building an assessment program that focuses heavily on the animals' natural abilities, behaviors and motivators. Through this program want to provide evidence-based care that allows each individual the ability and opportunity to live a species-typical life. Over the past few years, Lincoln Park Zoo has been reevaluating their behavioral husbandry programs, working to reach the goal of building a program that pushes us into a constant cycle of evaluating and enhancing our care.

Our past program was item-focused, individual keeper driven, interaction based, and evaluation was primarily qualitative. During the process of reworking our enrichment program, we knew these were the key areas we wanted to focus on changing. The following sections highlight the steps we are taking to change these key components.

Methods

Program Focus - When considering our program focus, we took a deep dive into what enrichment really is and why it is so important. After our initial conversations, we began to see that enrichment was more than just the item. It should be more than just checking off that it was provided or ensuring that the animal interacted with it for a certain amount of time. It should be about the experience it provided for the individual. "Enriching experiences" is a term we came up with that may better describe what it is we are

working towards offering our animals within our enrichment program. An enriching experience is something that encompasses many aspects of animal care, all of which contribute to allowing the animals we care for to exhibit their natural behaviors. This can take the form of an item that can be provided to allow for a natural behavior to occur. It can be within the day-to-day management decisions, including how and when the animals are fed, or what areas they have access to. Enriching experience opportunities may also be built into the exhibit itself, such as substrates that are available for digging, pools for swimming, and climbing opportunities. Lastly, it could come from the nutrition side of care when considering the types of food included in the diet.

Institution Driven Program - When considering our goal of creating an institution-driven program we wanted to move away from one person taking on the responsibility of the program for the species. By creating a zoo-wide program, more resources could be relied on. In addition, the program can be developed in a more goal-focused way which allows us to avoid too much individual ownership or emotions. Various roles can provide different opportunities to enhance the program as needed. For example, keepers can make changes to day-to-day opportunities as they are the front line of the program. They can organize schedules, think up new techniques or items, and implement the plan daily. In addition, they assist with the evaluation process by keeping good records and observing their animals on a regular basis. Managers have the ability to enact changes in exhibit offerings, social grouping, and species choices based off species needs and keeper feedback. Senior staff can endorse larger change and decisions such as exhibit renovations when situations call for it. The institution as a whole can work to raise funds to provide for this program as well as create assistance programs like volunteer groups that can assist in building a behavior-based program with a strong evaluation system.

Behavior-based, Evaluation and Readjustment - To build a behavior-based program, we decided to first identify what behaviors individual species should be doing on a day-to-day basis. To do this, we developed ethograms for the species we care for. We began by researching the species natural history, taking note of any behaviors a species was specifically adapted to perform. We then organized these specific behaviors into an ethogram broken down into six broad, functional categories (Inactive, Feed/Forage/Drink, Locomotion, Undesirable, Other Solitary, and Social). Definitions of behaviors were made to ensure we were encompassing the core component of behavior we were looking to identify and promote for each species. An example for behavior definitions are as follows (Red River Hog)

Rooting - Using snout to excavate soil, often for the purpose of extracting buried food items (Score Rooting if they are feeding on a piece of food that was recently excavated. If pushing through straw for food, score Substrate Foraging).

Feeding - Animal is consuming a food item without foraging behavior or ingesting water

Extractive Foraging - Animal is physically manipulating an object to extract a food item (e.g. includes any food in enclosed containers like boxes, bags, ice blocks, puzzle feeders, etc.).

Substrate Foraging - Animal is visually scanning or manipulating loose substrate (e.g. straw, mulch) to search for food items or moving a minimum of one body's length to acquire small pieces of food from the substrate (i.e. when food items are scattered across the ground).

Once we had identified the behaviors we should focus on for a specific species, we began to look at ways to quantify behavior patterns that could support a goal setting process. We chose to use activity budgets as our tool to help guide and organize our goal setting process because we felt it was important to identify not only the type of behaviors we should be helping promote, but also how much time they should be spending doing these behaviors. This approach was even suggested in Drs. Mellen and MacPhee's ⁽¹⁾ paper from 2001 that outlined the SPIDER framework. They highlighted the importance of not only encouraging species appropriate behavior, but also the frequency of that behavior. In addition, activity budgets are commonly used to study enrichment, usually in studies focused on the enrichment item and the animal's interaction time. Activity budgets play a fundamental role in species natural biology and, by setting activity budget goals, it allows us to set a standard of behavioral health for a species.

At Lincoln Park Zoo, we have developed an on-grounds behavioral monitoring program using trained volunteers and interns collecting data using the ZooMonitor app. By using this app and building a large volunteer/internship program, we have been able to monitor about thirty species daily. By building this behavior monitoring program, it has allowed us a unique opportunity to focus on the broader enrichment program itself. This behavior monitoring program has driven our development of our goal setting process for our enrichment program.

Once an ethogram has been built for the species, the next step is to develop activity budget goals. We rec-

ognized that the task of setting goals for each individual behavior in a large ethogram is not feasible so instead we decided to set goals for our six broad categories. We use field or zoo literature, pilot data from our behavioral monitoring program if available and our staff expertise, to develop time budget goal targets and ranges for broad behavior categories. In addition, for certain species we will specify goals for key natural behaviors within the broad categories. Our goals are partly philosophical in nature and are not intended to be constrained by our current spaces. We see them more as a guiding light toward what we hope to promote for our animals. We are making best guesses of what the ideal behavioral profiles should be for each species living in a zoo environment. Once we have set our activity budget goals, we take another look at the ethogram and pull out specific behaviors that we feel can be promoted by enrichment items. This list will be our enrichment items goals source list. We can then assign these behavioral goals to enrichment items that are approved for the species. We acknowledge that these are our best guesses and may be modified over time as we carry out further evaluation of the items.

Once we have gone through this goal setting process, our documentation system will allow for later evaluation and readjustment. We document enrichment through keeper records and behavioral observations. We then use these resources as well as item goal and safety evaluation to make choices about readjustments to our program per species. Keepers rate enrichment based off two scoring systems, enrichment behavior goal and usage level. This information is compiled on the Tracks software. Tracks allows us to sort our enrichment and rankings so that we can evaluate based off of what is recorded. This allows us to have a quick look at items to see if they help promote the goals we have set and if our animals interact with them or not. Based off of this information, we can make decisions about if enrichment items should continue to be used or need to be modified.

Our second level of evaluation takes a closer look at the usefulness of specific enrichment items. We are currently piloting this idea. For this evaluation, individual enrichment items are evaluated to see if the behavioral goals assigned are actually reached through the animal's interactions. Three 5-minute observations are taken over the course of a day. The first observation is done immediately after the animal is given access to the enrichment item, the next two can be done at any point throughout the day. The observations are item focused and behaviors are scored using an all occurrence method. The goal is to reach about 30 observations per item. With this information, we should be able to definitively say whether an enrichment item helps promote a behavioral goal we have assigned to it. If it does not, or we never see any interaction, we can remove the item from our rotation or change the behavioral goals set to it. This evaluation may also help see changes that could be made to the item or how it is presented to help the item be more successful.

Our last method of evaluation pulls from the behavioral observations we gain from our volunteers and interns. We create quarterly behavior reports by exporting our data from ZooMonitor to Microsoft Power BI. By using this software, we have built custom reports for each species. These reports show the overall activity budget for the individual animal over the course of the quarter. It also displays the behavior categories and the goals set to show where the individual is at for each category and specific behaviors if goals were set. At the end of the reports three questions are asked: 1) What changes happened this past quarter; 2) What goals or topics should be focused on or discussed for next quarter; and 3) What are our action plan goals and steps?

These reports are given to our keepers, manager teams, and welfare team to review and comment on. Once the reports have been reviewed and the questions are answered, the behavioral husbandry and enrichment manager reviews and organizes the information into condensed goals. These goals are then presented to the animal care team. From these, one or two are selected and action plan steps are written up. As steps are completed and milestones are reached, we are then able to evaluate the effect it has on the animal through the quarterly report process. This is an ongoing process of evaluating and then enhancing.

Conclusion

The process of revamping our enrichment program is continual. We began by piloting the program explained in this paper with only a few species. Over the course of a few years many aspects were changed or tweaked. We recognize the program we are building will take time and resources to grow to be capable of covering all the species at Lincoln Park Zoo. This type of program gives us an in-depth view of our animal's daily activity and allows us to make informed decisions about how to improve our enrichment and management. It allows both management and keeper staff to take a deeper look into their species and become experts on their natural behavioral history. Animal care members take a deeper dive into behavior by looking at the mechanics and motivations for certain behaviors. In addition, this program can provide useful insights to

our welfare science program in evaluating the welfare of our animals.

Although the program we are building does require a lot of resources and tools, we feel there is benefit in each component as well. Not all institutions have the ability to have regular behavioral observations being taken on their animals. Even if this is not possible, going through the process of building an ethogram and identifying behavioral goals can be a very beneficial first step to improving an enrichment program. In addition, utilizing documentation taken by keepers can be an extremely useful tool when evaluating enrichment items. The key to building a strong evaluation and readjust model is working this process into the program so that it occurs on a regular basis. By continually producing quarterly reports and using them to drive conversation, we have been able to make adjustments regularly.

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Polar Bear Conservation Training At The Oregon Zoo...Let's Dive In!

Amy Hash¹, Amy Cutting¹, Nicole Nicassio¹, Jenny DeGroot¹, Robert Draughon¹, and Sara Morgan¹
¹Oregon Zoo

In 2008, the polar bear (Ursus maritimus) was classified as a threatened species under the U.S. Endangered Species Act. Zoos now have an opportunity to use cooperative training to collaborate with researchers, and better understand the challenges that polar bears may face in the warming Arctic. After a successful voluntary blood collection from 1.1 polar bears at the Oregon Zoo in 2012, a researcher from the United States Geological Survey (USGS) invited us to participate in a nutritional ecology project. This collaboration developed into an ongoing energetics research project with the University of California, Santa Cruz (UCSC) and USGS. This research included training a 0.1 polar bear to wear a satellite collar and walk on a treadmill in order to obtain the energetic cost of resting and walking on land. The next phase of this three series project involved training the bear to swim and rest inside of a metabolic swim chamber to determine the energetic cost of aquatic locomotion. The researcher was able to compare the energetic costs of swimming to the resting and walking costs of polar bears and other species of semiaquatic marine mammals. Climate scientists predict with the decline of Arctic sea ice, polar bears will be forced to swim longer distances to reach stable platforms for denning and catching prey. Continued research examining metabolic costs of polar bears is needed and the Oregon Zoo is committed to continued support of these conservation efforts.

In 2011, 1.0 “Conrad” and 0.1 “Tasul” were the first polar bears to allow for voluntary blood collection in a zoo setting (DeGroot et al. 2014). The voluntary blood collection on these polar bears received the attention of researchers and led to the Oregon Zoo collaborating with these partners. Our first project was with Dr. Karyn Rode from United States Geological Survey (USGS). This was a nutritional ecology study that required frequent blood and hair samples. Our second project was a three phase project proposed by biologist Anthony Pagano from USGS. Phase one hoped to remotely identify polar bear behavior using tri-axial accelerometer devices. The next phase of the project was to measure the oxygen consumption of zoo adult female polar bears while resting and walking on a motorized treadmill. The final phase was swimming in a metabolic chamber. For more detailed information on the previous work at the Oregon Zoo, please see the Oregon Zoo paper that was presented at ABMA in 2017 titled, “Polar bear conservation training at the Oregon Zoo.”

When collaboration began with Pagano, the zoo did not have a metabolic swim chamber on site. Construction of a stand-alone polar bear metabolic swim chamber would be prohibitively expensive. However, with the addition of an Endless Pools motor and Plexiglas encasement, the zoo’s existing wave room could become a metabolic chamber with relative ease. (Fig 1)

A recent study suggested the costs of swimming to be five times greater than walking based on modeled costs derived from internal body temperature data from two wild swimming polar bears (Griffen 2018). Polar bears exhibit little streamlining, have small propulsive appendages relative to aquatic mammals, and primarily swim at the surface (Fish 2000). At the surface, drag can be up to five times greater than submerged swimming (Williams 1989). Like most semiaquatic mammals, polar bears are paddle swimmers, which have been shown to be an uneconomical form of locomotion due to energy lost through inertia, nonthrust movements during power strokes, and increased drag during recovery strokes (Fish 1992).

Methods

The plan was to train Tasul to swim in the metabolic chamber while wearing an accelerometer collar while simultaneously recording oxygen consumption. Staff was able to train Tasul for numerous months and troubleshoot some of the challenges associated with the construction of the metabolic swim chamber. Unfortunately, Tasul became ill and was euthanized in November 2016. Although unable to complete the swim trials, she was pivotal in how much staff has accomplished in conservation training.

The zoo also housed one year old female Nora. Although not trained to wear a collar, Pagano thought valuable data could be obtained from her swimming and resting in the metabolic chamber. Staff immediately started desensitization with Nora in the metabolic chamber. Access was given to the chamber during the day and she was given her fish diet from the food port on most days. She was conditioned to the various speeds and sounds of the Endless Pool motor. The set up for the days of research were going to look and sound very different than a normal training day. Hoses, computers, vacuum pump, new people and video cameras would all need to be desensitized. Staff made it a point to have numerous people watching and varying items present when doing training sessions. Nora was trained over an 11 month period and conditioned to rest in still water while standing on her hind legs or bracing herself against the sides of the wall. Staff extended the period of time between reinforcing Nora as she needed to be restful in the swim flume for a minimum of 10 minutes. Staff found it more challenging to get Nora to swim and eat while not resting on the walls or mesh. Through trial and error, we found that having the Endless Pool at a higher speed and allowing her dive a bit for some of her fish helped to keep her moving. During both the training of this behavior and trials, the bears were never locked in the metabolic swim chamber. They could choose to leave the chamber at any time. The chamber was intentionally built so that the entrance into the chamber was under water. This would allow for no flow of oxygen out of the chamber and the bears would not need to be shut in.

Data was collected over four days and 10 trials in the swim flume (Fig. 2, 3). On the first day of trials, Nora was very distracted by the vacuum hose that was connected to the swim flume. By the second day, she was more willing to participate and eight more trials were completed over a three day period. Oxygen consumption and stroke frequency while both resting and swimming within the swim flume were measured. Pagano compared the cost of aquatic locomotion to resting and walking costs in polar bears and the costs of swimming in other species of semiaquatic and marine mammals (Pagano et al. 2018).

Results

The findings corroborate the high energetic costs of swimming in wild adult polar that were modeled by Griffen (2018). Pagano notes, that the study should be interpreted cautiously and as a preliminary assessment (Pagano et al. 2018). The immature age of the bear, the behavior of the bear in which it both swam and dove during measurements prevented him from measuring her swim speed to calculate relationships between metabolic rate and speed resulted in being unable to directly evaluate transport costs while swimming. The trials consisted of one bear and the average temperature of the pool water is very different than that of arctic waters. Pagano hopes future research can examine the costs of surface swimming in adult polar bears at variable speeds and in variable water temperatures to better quantify the costs of swimming in wild polar bears. In view of ongoing (Stern and Laidre, 2016) and forecasted (Barnhart et al. 2016) declines in Arctic sea ice, the rate of swimming in polar bears is expected to increase (Derocher et al. 2004). Our preliminary results suggest that increases in swimming rates would greatly increase energy expenditure with implications for body condition, reproductive success, and survival.

Conclusion

The Oregon Zoo set out on a pilot project when designing a metabolic swim chamber. The conservation research proved to be enriching and challenging for both bears and staff. We believe the overall welfare of the animals was improved and guests were inspired by our work and the relationships with the animals.

Much more work is needed on physiological & behavior ecology and reproductive physiology to gain a better understanding of ongoing challenges polar bears are facing with declining sea ice. We look forward to more collaboration with scientists in the near future. Our new exhibit “Polar Bear Passage” is scheduled to open in fall 2020 and we look forward to putting the metabolic swim chamber to use (Fig 4).

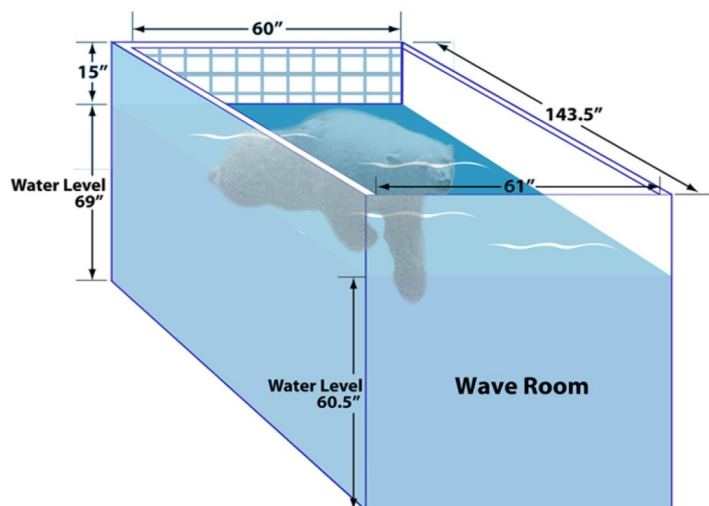


Figure 1



Figure 2



Figure 3



Figure 4

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Sexual Maturity Confirmation In Group Housed Female *Macaca Fascicularis*: A Team Collaboratoin

Angie Fontenot AA AAS MSL RLATG CMAR¹, Keely McGrew B.Sc CVT RLATG CMAR¹, Ashleigh Boyd B.Sc¹
¹Charles River, Houston TX

Determining sexual maturity of female macaques requires daily manipulation of the animals to obtain a swab of the vaginal area. Typically, animals are pair-housed in cages equipped with squeeze-backs to facilitate positioning of the animals for this process. During a veterinary team transition, our behavior team offered to utilize portable transport chutes with dividers to start swabbing adult female macaques that were living in group housing areas to assist the veterinary team with the confirmation process without social disruption. The use of the transport chutes in this way required refinements to the transport chutes and to the process, involving a collaborative effort between behaviorists, facilities and veterinary staff. Refinements to the process included making a frame to match the opening sizes of the transport chute and social housing unit, a cable hoist to open and close the chute door from inside the pen, a ratchet strap to secure the transport chute to the housing unit, desensitization of the animals to the process, facilitation of moving the animal's tails away from the divider slots inside the chute, and rods to secure the dividers close while working animals in the chute. Through communication and these refinements, the team was able to confirm sexual maturity in several females without disrupting social relationships.

Introduction

Charles river operates as an import quarantine facility known for being a leader in providing healthy and well-adjusted purpose bred animal models to companies that are working on drug development and medical cures. The facility's animal population fluctuates with new arrivals coming in often and ones just out of quarantine shipping out. Animals are quarantined for 4 to 6 weeks to assess the health status and ensure the quality of animals entering research before shipping them to their new facility. Animals are either pair housed in individual rack style caging or social pens consisting of an average of 8 animals.

Nonhuman primates are an important animal model for specific biomedical research because of their close similarities to humans. One of the goals of research is the prevention or treatment of diseases. Research requires biological samples to be collected. Primates can be trained with positive reinforcement training techniques to allow staff to swab the vaginal area to collect samples to confirm sexual maturity.

Purpose of poster

The purpose of this poster is to demonstrate the positive power of team work and collaboration which resulted in increased animal welfare, while accomplishing study screening objectives at the same time.

Cynomolgus ovarian cycles

Cynomolgus macaques "provide excellent models for preclinical testing and safety assessment of female fertility" ([Weinbauer et al., 2008](#)). Research on Cynomolgus ovarian cycles demonstrates "the prolongation of menstrual-cycle duration corresponded to a statistically significant absent or decreased preovulatory estradiol peak and loss of the normal luteal progesterone rise in cycle 3, whereas from cycle 6 onward,

hormone patterns appeared normal” (Weinbauer et al. 2008). Weinbauer’s findings suggested a “need for either individual housing or use of pairs and groups with an established history of social contact for at least six months (et al 2008). Considering the importance of “housing history and familiarity between the animals” (Weinbauer et al. 2008) the behavior team decided to keep the established groups together while checking sexual maturity.

Benefits of social housing

Nonhuman primate “social contact has been demonstrated to be one important variable necessary for promoting species-typical behaviors while reducing the levels of abnormal behavior” (Lutz & Novak, 2005). Some of the natural behaviors that can be seen are “grooming, playing, mounting, or huddling” (McGrew, 2017). Group housing has an added benefit of paralleling the macaque behavioral and social contact in the wild.

Positive reinforcement training constraints

Quarantine facilities run into challenges when implementing positive reinforcement training programs. These include such things as the short one to two-month length of time they are at the facility before being transferred to customer, the inability to bring training equipment or supplies in and out of rooms, the limited time of staff, and the complexity of training in quarantine rooms where staff must wear personal protective suits and shower out.

Process

Over a time, span of almost 5 months the behavior team was able to confirm 30 females for sexual maturity without any interruption of the 4 well bonded groups using portable transport chutes. Social housing is a very important part of animal welfare. This would not have been possible without collaboration and innovation. Collaborative team “projects can effectively contribute to successful captive management strategies, serving as effective components of a comprehensive behavioral management program” (Schapiro, 2017). Charles River understands that creativity thrives when people work together as a team. One of the core values of the company is collaborate which is used to guide our decisions, interactions with others, and individual and team behaviors.

For this project we leveraged the skills, knowledge, expertise and unique perspectives of individuals from multiple different teams within our site. By fully embracing this diversity of thought, we were able to modify our transfer chute so that we could be able to quickly individually separate, swab, and release each animal daily. We approached each obstacle as an opportunity to brainstorm ideas and possible solutions as a group.

We had multiple obstacles to overcome to make this work efficiently and ensure we obtain the daily swab from each animal. Our first obstacle was that our current transport chute in use did not have an effective method of positioning the animals to allow swabbing. The solution the behavior team came up with to fix this issue was to use another style of portable transport chute instead. However, it required modifications for this use. The first step was unscrewing one of the ends of the transport chute to get animals inside.

Trolley #1 unable to use

Trolley #2 used

Trolley #2 door removed

The second obstacle was the door to the transport chute didn’t match the height of the animal housing door. The behavior team met with the knowledgeable maintenance staff to find a solution. The maintenance staff came up with a perfect solution. The team designed mesh and a chute extension around the entrance to the chute.



Chute extension added

The third obstacle was a large gap between the transfer chute and pen which allowed animals to push the transfer chute away from the enclosure and attempt to get out of pen. The behavior team used a ratchet strap to tightly secure the chute to the cage front as a solution. This allowed a tight fit against the front of the chute and the cage front that kept the animals from being able to push the chute away from cage front.



Gap



Ratchet strap used

The transfer chute the behavior team used was designed to allow animals to be individually separated. The chute had a lever which to pull the animals towards the front of the chute to gain safe access to the animal. This was very helpful at first during the training of the animals to allow swabbing. However, the obstacle the behavior team ran into was that animals could push the dividers out during separation for the swabbing process. The behavior team came up with the idea of using a long all-thread screw that would fit through the divider pull levers to secure the dividers in place. Swabbing was done with 8" cotton tipped applicators at the front of the chute for those that were successfully trained to turn around or present their bottoms for swabbing or underneath the trolley for those who wouldn't present.



Able to push dividers out



Long all-thread used

The last obstacle was the time constraint that led to the team having to start the swabbing project before all animals were 100% reliable at entering the transfer chute with trainers standing near the chute. The solution was to use paracord attached to the transfer chute sliding door and looped through the top of the cage ceiling to allow the door to be closed from a distance.

Process Steps

Strap transfer chute to front of cage door using ratchet strap
 Attach rope to cage door and aisleway ceiling then open cage door to allow animals to enter.
 Close cage door once the animals have entered the transfer chute.
 If any animals do not enter on their own, enter the cage to encourage animals to enter transfer chute
 Leave group together inside chute; selecting and separating one animal at a time in the front of the chute
 Show swab and swab those that present. Those that do not present, swab from underneath and/or use squeeze back to position the animal for swabbing.
 Release animal back into cage and reward

Conclusion

Animals that live in social housing have lower levels of stress and exhibit higher levels of species appropriate behavior (Novak, 2003). By promoting effective communication and establishing a partnership of collaboration amongst teams, we were able to maintain high standards of care and confirm 4 groups (30 animals) for sexual maturity. Primates live in groups in the wild (Honess, 2017), and by allowing these females to remain together during the process of collecting important physiological data, we enhanced animal welfare while avoiding the alternative (moving the animals out of their social groups during the time frame needed to determine maturity).

Acknowledgements

Thanks to the help and support of Charles River Houston staff and Charles River Ashland for providing the transport chutes.

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The Future of Zoos, Through the Eyes of a Dreamer

Steve Martin, Natural Encounters, Inc.

Walt Disney said, “First, think. Second, believe. Third, dream. And finally, dare.” I believe dreaming is what made Walt Disney so successful, and what helps shape zoological facilities of the future. Dreams have inspired me toward many goals, some achieved and many still living in my imagination waiting for the right condition to take flight.

I DREAM the zoological facility of the future will flourish in a safe zone where daring to act on dreams is supported and nurtured, and dreams that don't work out are seen as opportunities to start again with more information, rather than a failure to be punished through peer pressure or criticism. In future zoos, all animal care professionals will have a clear understanding of the science of behavior-change and be able to apply these principals at extraordinary levels with every animal at the facility instead of just the animals in their section. Through this exemplary training, animals experience optimal welfare and desirable behaviors will replace problem behaviors. I see animals in environments rich with behavioral opportunities, empowered with control, and motivated to use their senses and adaptations to “earn” a living, much like their wild counterparts. When animals do what nature built them to do, their behavior will convey inspirational stories that inspire caring and conservation action in guests at our facilities. These are a few of the dreams I will share in this presentation, along with strategies for how to move them toward reality.

Introduction

When I DREAM of the next level of zoological facilities, I think about advancements in animal training, animal welfare, guest experience and more. Maya Angelou said “I did then what I knew how to do. Now that I know better, I do better.” In future zoos, doing better will include breaking out of the comfort zone, discovering new goals, and daring to pursue those goals. It means good enough is never good enough because there is always a better way, if only you can DREAM it. A safe zone is required to nurture these kinds of dreams and inspire creative thinking and acting that will sometimes result in failure. In this safe zone is where people can realize failure is simply an opportunity to start again with more information. Life on this planet has evolved, in part, through failure. Every individual of every species has taken action that did not work well for them, and that failure led to different behavior and better outcomes that shaped the future behavior of that animal. Walt Disney himself experienced many failures, including being fired from his job at a newspaper for lack of creativity.

Creating a safe zone requires team work and high trust accounts. It is not uncommon to see people at odds with each other for one reason or another. Dr. Susan Friedman often says, “It’s hard being human.”, which is absolutely true. And I think it’s hard building trusting relationships as well. But, given the motivation and an understanding of the science of behavior change principals, it’s more than possible.

Think of building trust with any non-human animal in your life. You build trust through repetitions of behavior that results in positive reinforcement. You can’t force an animal to like you any more than you can

force a human to like you. You can force people to do things, just like you can force animals to do things, but threats and coercion weaken trust. Building trust with a human involves first discovering a person's reinforcers. For many, recognition is a strong reinforcer for behavior and it can be something as simple as saying "Thank you" or "Nice job" when you genuinely feel the praise is warranted. We often miss opportunities to reinforce behavior and make a deposit into the trust account because we expect people to operate at a certain level without reinforcement. People have actually said to me, "I'm not going to thank him for doing what he gets paid to do."

Unfortunately, many people squander trust catching people doing something wrong rather than building trust by catching people doing something right. I'm not saying you should avoid correcting people. On the contrary, I am saying when a person does something wrong, you have an important opportunity to add trust to the account by helping the person grow from the experience. When your motivation is to help and not hurt, you look at these opportunities differently. When someone does something wrong, look at it as an opportunity to help that person grow, put trust into the account, and create a "safe zone" where the person is comfortable learning from mistakes. Otherwise, people might hide their mistakes and then no one learns from the situation and the same mistake may be made by others.

For some, it is reinforcing to yell at people and express their discontent while motivating people to comply with rules or commands. Forcing people to perform out of fear of reprimand is not uncommon in some facilities and may get some short-term results. However, animals, including the human animal, motivated by threats will only operate at the level necessary to avoid the aversive stimulus. On the other hand, animals motivated by positive reinforcement will look forward to the interactions, be more creative about how to earn the reinforcers and will work harder to gain the reinforcers. Just saying "Thank you" or "Good job" can reinforce desirable behavior that might replace unwanted behavior and build trusting relationships at the same time.

Dreaming of Expert Training

Animal training in zoological facilities is more common than ever before. However, the application of training technology varies greatly from one facility to the next and from one person to the next. Training with positive reinforcement is a relatively new activity in zoos and, as such, many people are left to their own imagination and guesses when figuring out how to shape a new behavior. They think they are doing a good job because they make some progress. But, they invest their belief in a technology that they know so little about. Far more than clicking a clicker and giving a treat, expert animal training involves extraordinary mechanical skill, deft perception of body language and antecedent conditions, and an exceptional understanding of the science of behavior-change principals. These are just a few of the most important characteristics learned through experience and expert guidance.

My DREAM is for all animal-care professionals to give their animal a "voice" through its behavior. When an animal has the ability to say "No" and the trainer acknowledges this communication with appropriate behavior, such as backing away, the animal experiences a level of control that forms the foundation for a trusting relationship.

As we walked by a clouded leopard's enclosure at a zoo, the leopard jumped up on the platform at my eye level, just inches away, and showed overt aggressive body language, e.g. vocalizations, staring at me, and hair raised. I said to the keeper, "Ok, let's just keep moving." She responded, "No, wait. We have to stand here until he is calm, then we can go." I kept quiet and followed her lead. After a minute or so, the aggression subsided and she led the way out of the building. When I asked why she wanted to stay there in front of the cat with all that aggression happening, she replied, "I was told we have to stay there because he wants us to leave and we don't want to reinforce that aggressive behavior. So, we have to wait for the animal to calm down and then we can leave to reinforce the calm behavior." This led to a good conversation about who we want to be to that cat, and how do we know what the animal is thinking?

Do we want to give the animal a voice or take away its voice? Do we want to be the boss, the alpha, the leader, and make the animal comply with our commands? This may work for some people with some animals on restraint or when they can inflict pain, discomfort, or fear. But, my goal is to be a partner with the animal, someone who the animal wants to be around because of the positive interactions. If an animal tells me, through its body language, that it wants me to leave, then I leave. To stay would probably take trust from our account. After I leave I build a plan for how to create a trusting relationship with that animal through positive reinforcement. One of my favorite plans is to repeatedly walk past the animal and drop a piece of food in a place the animal can reach, like a food chute, or tossed under the door or through the mesh barrier. In this plan the food is place non-contingently and I never stop to look at or talk to the animal. The predictability of the reinforcer every time I walk by is important. This counter conditioning procedure will help the animal begin to replace fear behavior with calm, attentive behavior at my approach. There are many ways to build trust with that cat, but standing in front of it when it is aggressing may only lead to more aggression and a bankrupt trust account.

An animal's voice should be acknowledged by the trainer the moment she/he enters the room. Too many trainers just blunder into a training session with no consideration for the animal's behavior. They place buckets of favorite food items in front of an animal, then arrange target sticks, tongs, bait sticks, and other training tools at their feet, all before ever looking at the animal. The animal had no opportunity to either invite the trainer into its personal space or express, through its body language, a level of concern that would stop the approach of a sensitive and skilled trainer. When information flows one direction, the stage is set for a "Command session" instead of a training session where information flows in both directions.

In my DREAM, a command is different from a cue in that it suggests an animal must do the behavior or there will be aversive consequences, such as a time out. Commands are often associated with a loud, stern voice, strong demanding body language, and an attitude that the animal must obey. Common in command sessions is the idea that an animal is trying to put one over on the trainer, messing with his mind, or has some other nefarious motive for their actions. This leads to blaming the animal for any undesirable behavior. The moment a trainer blames the animal and washes his hands of the responsibility for undesirable behavior, is the moment dreams become mired in old-school mentality and fail to progress training outcomes at a high level.

To DARE to take responsibility for your animal's undesirable behavior is a big step for many trainers. For some, it may create a feeling of vulnerability to criticism or compromise their status as an elite trainer. For others, it may mean more work to try and figure out what they did wrong or how to find solutions for the problem behavior. For whatever motivation there is to blame the animal, there are strategies and solutions inspired by the empowerment that comes with accepting responsibility for problem behavior of the animal you are training. The first step is to recognize the animal's behavior reflects your training skills. The second step is to understand "behavior is not in the animal, it is in the environment we create," which is another one of my favorite quotes from Dr. Susan Friedman.

THINK about how clear, two-way communication might improve your training outcomes. Perfectly timed and delivered cues (S^D), meticulous use of prompts, precise timing of bridging stimuli, and immediate delivery of reinforcing consequences are just a few things trainers do that bring clarity to the training environment. Animals communicate in kind with subtle body language that skilled trainers read and instinctively adjust their own behavior to promote this important dialogue. Unfortunately, not all communications are so clear in today's training environments.

Time out from positive reinforcement is a negative punishment training procedure used too often in current training sessions. It is confusing to animals and often results in aggression, apathy, or frustration. At best, a time out tell animals what not to do. However, expert-level training occurs when communications are focused on helping an animal understand what to do in a positive reinforcement program. Generally, trainers give time outs in an attempt to punish a specific behavior or even an animal. They blame the animal for what

is often a trainer error associated with un-clear criteria for behavior, low rate of reinforcement, poor antecedent arrangement, or poor mechanical skills. My DREAM involves trainers responding to undesirable behavior not with time outs, but by ignoring wrong behavior and then immediately cueing a couple of high probability behaviors, each followed by high value reinforcers. This will create behavioral momentum that will often get the animal back on track and with more motivation when the trainer cues the behavior the animal missed earlier. Alternatively, the trainer could ask for a high probability behavior followed by a large quantity of high value reinforcer and leave the training area to reevaluate the training session and determine his or her role in the unwanted behavior. The trainer should also take this time to create a new plan for how to replace the unwanted behavior with desirable behavior so there will be no need to consider a time out again. Often, this means raising the rate of reinforcement, shortening the training session, or using more clear criteria and communication with the animal.

Communication is also muddled when trainers fail to follow a bridging stimulus with a back-up reinforcer. They mistakenly think this form of training is a variable schedule of reinforcement. They fail to realize if the bridging stimulus is a reinforcer (a secondary reinforcer) they are using a continuous schedule of reinforcement. Technically, failing to back up a bridging stimulus with a reinforcer is a respondent extinction trial. Just as Pavlov paired the metronome sound with the meat powder that triggered salivation from the dog, a clicker, or other bridging stimulus, is paired with food (or other reinforcer) in our training sessions. Pavlov called the metronome sound a conditional reinforcer ... the meaning of the metronome is conditional on being paired with a back-up unconditional stimulus. When his work was translated from Russian to English, the word “conditional” was translated as “conditioned” – a very different word and meaning. When trainers fail to back up a bridging stimulus with another reinforcer, the bridging stimulus begins to lose its ability to predict another reinforcer is coming. Consequently, the bridging stimulus loses its ability to mark specific behavior, the rate of reinforcement decreases, and animals get confused. All of this can lead to poor training outcomes, frustration-elicited aggression, apathy and so much more. Unfortunately, when these things occur, many trainers blame the animal instead of their training strategy. BELIEF in the science and reevaluation of training strategies would empower trainers with better tools in times like these.

But, what explains when animals continue to work in this misguided training system? When the clicker, whistle, or verbal bridge is not reliably backed up with another reinforcer, many animals will simply look for more salient information about when a reinforcer is coming. They start watching the trainer’s body language. The subtle movement of the hand toward the bait bag is a visual bridging stimulus that often supersedes the audible bridging stimulus, especially in training systems where the bridge is not reliably backed-up.

So, what if a trainer wants the animal to perform multiple behaviors before getting a food reinforcer? It is possible to thin the pairing of the bridging stimulus and the back-up food reinforcer so the cue for a behavior becomes the bridging stimulus and reinforcer for the previous behavior. However, it is important to note that this is a process that should be implemented systematically over time to help the animal understand not every performance of a correct behavior will be reinforced with food. When done right, the cue gains history of predicting reinforcement is coming and it will itself become a conditional reinforcer. Ultimately, a trainer can perform a sequence of multiple behaviors with the food reinforcer reserved as the consequence for the final behavior in the sequence. In this system, the audible bridge is not sounded so you maintain the meaning of the bridging stimulus through the reliable pairing with a back-up reinforcer. Again, I emphasize that this system should be systematically implemented over time, generally several months or even years. Too often, animal trainers move haphazardly and reduce the pairing of the bridge and the back-up reinforcer and most often confuse the animal and weaken the meaning of the bridging stimulus.

Dreaming Welfare

Improving welfare is more than modifying enrichment programs and doing more positive reinforcement training. Improved welfare is associated with every interaction and every condition we create for the animals in our care.

I DREAM that one day the predictable nature of life in human care will evolve to more closely simulate the variable environment of life in the wild. Feeding regimes will change from the perfect diet placed in the same place, on the same stainless-steel plate, at the same time, by the same person every day, to a system where animals are empowered to perform behavior for their food by using their senses and adaptations to “earn” a living, much like their wild counterparts. Caring for these animals does not mean protecting them in a vacuum from every possible danger, distraction, or bacteria. Caring for our animals will mean preparing them to live safely in an environment filled with risks, uncertainty, and distractions. Expert training will be an essential tool for preparing animals to deal with life in human care, from helping animals cope with novel and aversive situations, to teaching them to voluntarily participate in their own health care. Expert training is a critical tool for providing the highest welfare for animals.

In my DREAM, people will reevaluate all interactions with animals, including their assumption that training with positive reinforcement has improved the welfare of their animals. In some cases, welfare has decreased when animals are brought into a positive reinforcement program. Competition for food reinforcers can cause aggression between conspecifics, diets can get reduced to unhealthy levels to create motivation, trainers can cause frustration and aggression with unclear communication and poor training strategies, and raptors and other animals are taken out of exhibits, restrained on jesses or leads, and trained by well-meaning but inexperienced handlers. The list goes on and on. Positive reinforcement training done well can certainly improve welfare in many ways. But, training done poorly, or especially with the wrong animal or trainer, can decrease welfare.

Owls obtained from rehabilitation programs and used in educational programs are on the poor end of the welfare continuum. They simply do not adjust well to life in human care like many other species of raptors. When owls are handled by non-expert trainers, their stress rises, and welfare decreases even more. The best owls for use as ambassador animals are ones that were raised by humans. Unfortunately, some people think they are doing a good deed when they “rescue” an injured owl from a rehabilitation facility and give it to their education staff for use as an ambassador animal. My DREAM is for no more adult owls from rehabilitation to be brought into ambassador animal programs at zoological facilities. Adult owls from rehabilitation programs already in ambassador animal programs would experience improved welfare in an exhibit where they are not handled by humans.

I DREAM all institutions will truly evaluate welfare using observable behavior considered from the animal’s perspective. When an animal has a vote to participate or not, caregivers become partners in the relationship and force and coercion become a thing of the past. Welfare should be more than a goal for zoological facilities and animal care professionals to pursue. Welfare should be the lens through which we view all of our interactions with animals in our care and the criteria with which all of our animal programs are judged.

Dreaming of Exceptional Guest Experiences

Over 700 million people visit zoological facilities each year. How many of them leave without better knowledge and attitude about animals and the planet we share with them?

I DREAM of guest opportunities that transcend traditional experiences of looking at animals in enclosures, maybe reading some interesting graphics, and moving on to the next exhibit like they would at a museum. In future zoos, animals will have access to habitats free of visual barriers, but still safely confined. Animals will roam out of their traditional holding space and into areas where guests can see them doing what nature built them to do, e.g., foraging, climbing, brachiating, swimming, and so much more. Their behavior will provide glimpses into the species-appropriate behavior of their wild counterparts. When animals can seemingly leave their exhibits but choose to return, the obvious take home message for the guests is, “The animals like being

here.”

Animal exhibits will focus more on animal needs and behavior than on visitor appeal and user convenience. With welfare as our guide, animal professionals will work closely with architects to design exhibits that not only look nice, but promote a wide range of species-appropriate behavior. However, providing opportunity for behavior is not enough. Without motivation, there is limited opportunity for learned behavior. When caregivers are also expert trainers, they will arrange antecedent conditions that motivate animals to use exhibits as they are intended and display species appropriate behavior that helps people learn more about the animals they are viewing. Exhibits will promote increased activity, provide mental stimulation, and expand the animals’ choice and control in the environment.

Traditional keeper talks and education programs will give way to engaging behavioral experiences staged in natural settings and convey important messages and stories through animal behavior. Where natural history lectures currently exceed the attention span of the audience, keeper talks in future zoos will include animals doing species appropriate behaviors that help tell our most important stories about our environment and the species with which we share this planet. Carefully designed messaging and engaging presentations will be the hallmark of habitat theater and exhibit shows. When these presentations involve husbandry or medical behaviors, we open the door for our guests to see just how much we care about our animals that we teach them to voluntarily participate in their own health care.

Formal presentations will provide a safe zone for guests where they are assured they will not be put on the spot and asked to participate if participating is not comfortable for them. A guest’s excitement and anticipation for a show changes when a presenter starts the show saying, “How’s everybody doing today?” and then follows with, “No. You can do better than that. How’s everybody doing today?” That attempt to rally the crowd and create enthusiasm usually backfires for people who do not appreciate being put on the spot or told they are doing something wrong. Other pre-show warnings like, “Don’t stand up. Don’t put your hands up. Don’t park your stroller there, etc.,” also drain the enthusiasm from the guests. To start a show this way often makes guests feel uncomfortable, maybe even enough to avoid the show in the future.

In future shows, the spotlight will shift from the trainer to the animal. Instead of trainers directing animals to perform behaviors, animals will perform species appropriate behaviors free of direction from trainers. When an animal follows a trainer’s cue to perform a behavior, there is a subliminal message that the trainer is in charge and the animal is following commands. When the animal performs behavior without trainer direction, the message is clear that the animal is in control.

A Chinese Proverb says: “Tell me, I’ll forget. Show me, I may remember. Involve me, I’ll understand.” In my DREAM, educational programs will focus more on involving guests in experiences than on reciting natural history information. As zoological professionals, we have a long attention span for natural history information and we tend to want others to know as much, and care as much, as we do about the natural world. However, these feelings won’t take root unless there is a bed of empathy to nurture the growth. Through close encounters and personal experiences with animals, we can spark an interest that can have a lasting effect on a person’s behavior.

Cheyenne Mountain Zoo leads the industry in connecting humans with animals. Each employee at the zoo understands and pursues the concept of “Defining Moments.” A Defining Moment can be any experience that inspires a person to change their behavior toward conservation action or simply caring more about animals. An interest can be sparked by feeding a giraffe, seeing a bird fly inches over your head, touching a charismatic animal, or one of many other encounters with animals. Any animal experience, especially when combined with engaging information, can inspire someone to become a member of the zoo, donate to conser-

vation programs, or start recycling at home. All around the Cheyenne Mountain Zoo, employees are on the lookout for opportunities to create defining moments for guests.

At Cheyenne Mountain Zoo young visitors provide opportunities for employees to pursue another one of their core values, “Every Kid. Every time. Goosebumps!” When a keeper sees a group of kids, she goes into action thinking of ways to provide an experience that might lead to goosebumps in a young visitor. Tossing food to an animal, touching an animal, participating in a keeper talk, and so much more can lead to goosebump moments that can change the life of a kid at the zoo. There are opportunities all around the zoo for guests to experience Defining Moments and Goosebumps!

Conclusion

“First, think. Second, believe. Third, dream. And finally, dare.” Those are the words that can direct our path to better training, better welfare, and exceptional guest experiences.

Zoos of the future will be filled with people who THINK about their current state, question everything, and continue to learn about every aspect of their job. They BELIEVE in a system where all animals deserve the most positive and least intrusive interactions with humans, and where an animal’s body language conveys important messages that keepers respond to in appropriate ways that give the animal a strong voice and empower the animal with more control in its environment. The zoo of the future will benefit from people who DREAM of new ways to improve every aspect of their job, from animal care and training to providing guest experiences that inspire caring and conservation action. Some of the most important changes in future zoos involve DARING to create your own path and take chances knowing there is an opportunity to fail. Zoos of the future will operate in a safe zone where people support dreamers and the mistakes they make knowing that some of the most valuable lessons are learned from failure.

THINK of where you are in life and where you want to be. Think of the path forward and what it will take to travel that path; what support you will need; what relationships you will need to form; what lessons you need to learn; what skills you need to acquire.

BELIEVE you have the ability to achieve your goals and there are many people who support you and want you to succeed. Believe people have good intentions and they act to help, not hurt. When you find that is not true of someone, kick them to the curb and stop wasting your time with them. Believe you are responsible for your position in life and stop blaming other people for your inability to move ahead. Believe you have the power to shape the behavior of people who matter to you. Believe mistakes are an opportunity to start again with more information.

DREAM of new techniques, new approaches, and new ways to connect with animals and guests. Dream of the trusting relationships you want to develop with humans and other animals in your life. Dream of the perfect enclosure, the perfect training session, and the perfect behavior. Then go beyond that dream to find even better ways to provide optimal care and better training and welfare for your animals. Dream of unlimited budgets and conditions free of all restraints, because that’s where you will find the path of approximations and the essential steps toward realizing your dreams.

DARE to get out of your comfort zone and try, even though you might fail. Remember you have people who support you and want to see you succeed. Dare to build trusting relationships even though it might be difficult and you might not know the way. Just keep in mind your positive reinforcement strategies with animals and catch people doing something right. Dare to go beyond conventional wisdom and create your own path. Dare to do what’s right instead of what’s convenient. It will be an investment in your future. Dare to change the world one animal and one human at a time.

Five Tools of Building Resiliency in Ambassador Animals

LynnLee Schmidt

Chasing that elusive “bomb-proof” ambassador animal? Wishing you had training tools for improving consistency throughout your staff? Trying to figure out what it means to implement choice and control?

Our goal is to engage audiences using ambassador animals, while overcoming the many constraints on how to connect the animals to our audience. There are basic problems that affect our ability to be successful (i.e. fear, aggression, and motivation). To counter these obstacles, we use a five-tool system to build resiliency, allowing trainers to be more flexible and dynamic in our programming.

First, trainers should focus on desensitizing the animal to sights, sounds, and experiences. This is one effective way build an animal’s confidence.

Second, build control indicators into your sessions. This allows your animal to signal when they want to start a session, continue a session, or end a session.

Third, use marks and stations that travel with the animal. In any setting these become a constant and reliable source of reinforcement.

Fourth, build behavioral mass behind the more challenging behaviors. Using deliberate primary distribution can work to improve an animal’s confidence.

Lastly, it is important to identify a “safe” space. This ensures the animal always has the choice of finding comfort when nervous, frustrated, or bored.

Using this format has built resiliency in our animals and has given our staff the confidence to be innovative, and has increased their ability to develop a connection to our animals and audiences.

Introduction

Many aquariums and zoos use ambassador animals to engage audiences and support their mission and messaging. Research has shown that stay-time and engagement are increased when ambassador animals are used in education (Povey & Rios, 2002). Guests are also better able to answer questions about the animal after an ambassador animal experience than just by seeing the animals on their exhibit (Beran & Schmidt, 2017).

While ambassadors can be great tools to connect our guests with our animals, working with them comes with challenges. Many animals make great ambassadors when they are young, but as they age behavioral challenges can make it more difficult to work with them, and many are retired near sexual maturity. In an informal survey of ambassador animal trainers 94.9% of the 79 respondents have removed an animal from programs. The majority of respondents (50% or more) cited stress, fear, or age as a reason for removing an animal (Figure 1.)

Reasons for retiring Ambassadors from programs

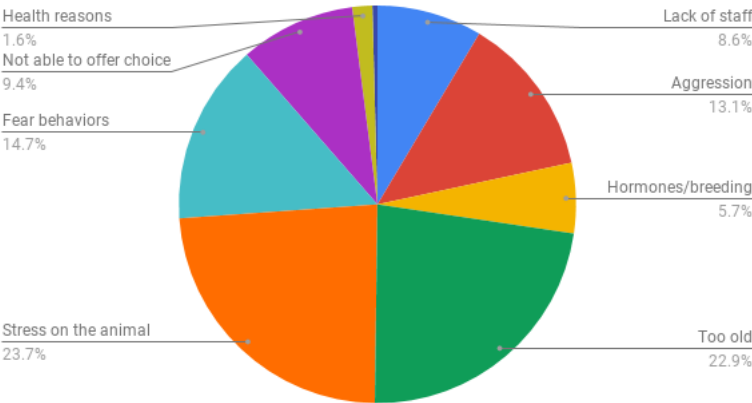


Figure 1.

Reptiles, invertebrates, and small mammals are often used since they can be managed by less experienced handlers and do not come with as many of the behavioral challenges ([Figure 2](#)).

Which can be handled by less experienced staff?

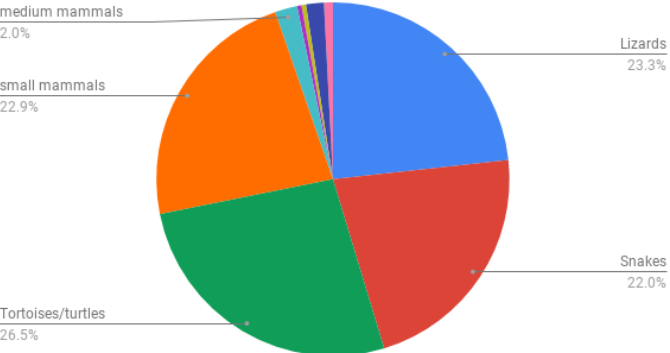
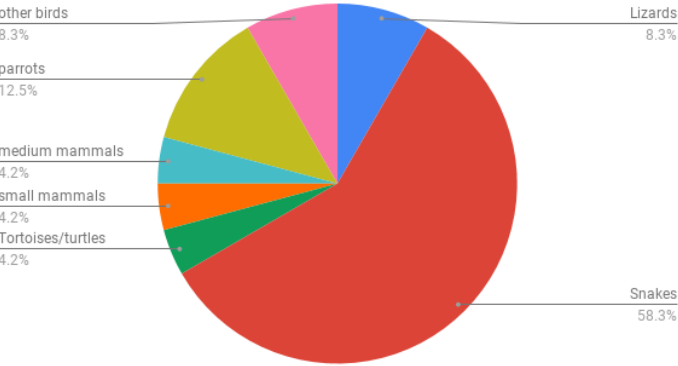


Figure 2.

What's the least popular with the public?



However, some of these smaller animals can be less charismatic and not as popular with the guests ([Figure 3](#)). There are also challenges in working with AZA population-managed species, since after dedicating time and energy into training and handling, many facilities are reluctant to allow these animals to enter into = breeding programs. In addition, in order to curb behavioral issues resulting from hormonal changes, historically numerous ambassadors were housed alone or sterilized to reduce hormonal challenges.

Figure 3.

Many ambassador animals are “grab and go” animals, meaning that they are removed from their enclosures by being picked up, placed in a crate, and presented on trainers’ hands for presentations (Figure 4). This might result in higher stress levels for animals, and adverse behavioral challenges including aggression. Animals that are handled without choice and control may be poor and unpredictable ambassadors. While there is little scientific evidence and numerous variables in determining which ambassador animal training methods are ideal, the mission of engaging guests and creating memorable experiences can be compromised by stressed, fearful, or reactive animals. This does not have to be the case. If we can develop ways to allow animals the choice to participate in and control their encounters, we can build resilience and confidence in our ambassadors, improving welfare.

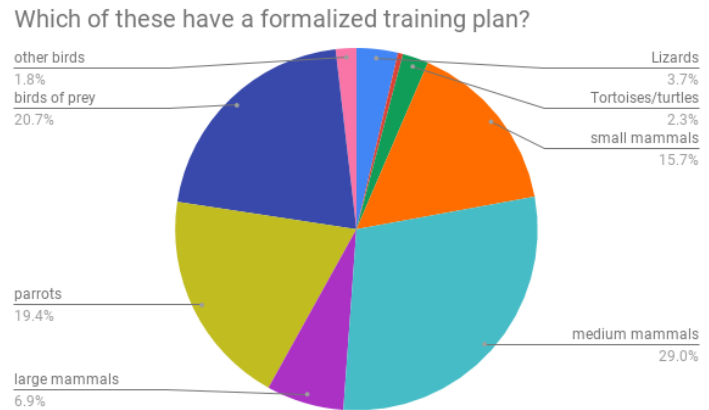


Figure 4.

At the Downtown Aquarium in Denver, the ambassador animal program evolved from a few chickens, rabbits, reptiles, and birds of prey, to a larger collection of animals including a binturong (*Arctictis binturong*), sloth (*Choloepus didactylus*), and North American river otters (*Lontra canadensis*). These ambassador animals appear daily throughout the Aquarium, offsite at schools and events, on stage in a show, during scheduled meet and greets with guests, at birthday parties, banquets, and various other events. Topping out at nearly 700 appearances per animal each year, the location is rarely the same, the audience is always changing, and our goal is to have each one of our ten full time staff members working all the animals. These factors require us to rely heavily on our training program and require a high level of performance from our animals.

Choice has been shown to be a primary reinforcer for animals, and our training philosophy at the Aquarium is built on this concept (Harris & Susta, 2016). We cater to the animal’s individual and natural history with design props, behaviors, and presentations that allow the animals to behave as naturally as possible. We work to ensure that we have a partnership with our animals where they are willing participants in our programming. The following tools are techniques we have used to ensure that those 5,000 appearances each year have the animal’s welfare top of mind while creating amazing experiences for the over 100,000 guests that we reach with our animals.

Confidence through Training

There are many ways to offer choice, consistency, and control to animals even in unpredictable situations. One great way is to start off on the right foot by using training to desensitize animals to the variables they might experience during encounters.

When the animals know what to expect, and have been exposed to the sensory inputs that they will encounter while they are out of their housing, they become more confident. One great way to plan for this is to start with the end in mind and work backwards just like you would write any training plan. At the Aquarium we know that our animals will be expected to walk and appear on our crowded and noisy pathway. In one of these walks, they will need to experience strangers moving near them, camera flashes, loud sounds, fish in their exhibits, other animals moving around their enclosures, and tight quarters. Once our new ambassadors have some basic behaviors completed behind the scenes, we often start by walking or taking them on to the pathway area before the Aquarium opens. This way we have eliminated large crowds, loud noises, camera flashes, and tight quarters. We lower the criteria that the animal must focus on the trainer and complete numerous behaviors and allow them to explore and look at the other animals while reinforcing them for check-

ing in with the trainer. Once we have repeated this approximation and have good focus and the animal is doing other behaviors then we might choose to walk them right before the Aquarium opens when the pathway sound effects are turned on but there are not guests. We might split that further by turning down the sounds and gradually bringing them up as the animal starts reliably performing its normal behavioral repertoire. Then we will choose a low traffic day and gradually pick busier and busier days until we reach our end goal: an animal focused on its trainer and performing its complete behavioral repertoire on a busy summer day during peak volume.

The second way we work to build resilience and confidence in our ambassadors is to build control indicators in to our sessions. These are opportunities for your animal to signal that they are ready for a session to begin, continue or end. For example, the African crested porcupine (*Hystrix cristata*) at the Aquarium has a station that she goes to when a trainer comes to the door of her enclosure. If she does not get up and go to the station, the trainer will not continue the session. Next, she is asked to do a few behaviors for the trainer. Again if she does not respond the trainer will not continue. If she completes those behaviors she will be asked to station for a collar and crate, and if she does not participate in those behaviors, the trainer will not continue the session. Another example is our three North American river otters (*Lontra canadensis*) have an acrylic shape ([Image 1](#)) that is always present during their sessions, and if they touch that shape the trainer ends the session. Offering these choices has increased participation and decreased frustration behaviors (Schmidt, 2018). Finally, some dog trainers will have a crate or mat in the area they are training at all times, and if a dog goes to this crate or mat it will always get fed. This allows the dog a way to say, “Your approximations are too big,” or “I do not understand what you are asking,” or “I cannot physically do that,” and still communicate “but I still want to participate.” All of the control indicators are opportunities for an animal to “opt in” to the training session and conversely “opt out”.



Sometimes desensitizing an animal to every possible thing they might experience is impossible. We cannot always predict what situations we will be in when we are at an offsite program or when we bring guests in for an encounter. One of the best things we can do for an animal is provide some kind of constant that does not change from location to location. This can be in the form of a mark, perch, or station and even a series of all of these things. Our serval (*Leptailurus serval*) prefers to be up high when in new and unfamiliar areas, so we have a cart that transports her crate and can also be used as an elevated platform ([Image 2](#)). Our three banded armadillo (*Tolypeutes matacus*) is trained to station on a green triangle and allow guests to touch her on the back. This incorporates consistency with the mark, and choice as well. It is also important that our trainers are consistent across locations and places. We do video consistency audits on chosen behaviors twice per month and watch at least two behaviors each month as a group to watch for consistency.



Another reason why marks, stations, and perches work so well to build consistency is because of behavioral mass and primary distribution. Working to build behavioral mass behind these confidence building behaviors is a great way to build resilience. The binturong (*Arctictis binturong*) at the Aquarium participates in meet and greet encounters in a semi private space on our exhibit pathway. There are three locations where she receives most of her primary reinforcement: a perch, a barrel, and a ledge. She is eager to get to move to these locations because she is asked to go on these stations often, she receives a large amount of her food there, and she has positive reinforcement history with each one. Each of these stations has behavioral mass. If someone bangs on the window, we can ask her to one of these locations and you can see her body relax, her ears soften, and her nose start working again. She associates these areas with positive reinforcement. There was a time when the crate behavior broke down for our binturong, we were able to use the behavioral mass of our station behavior to our favor. The binturong wouldn't stay in the crate long enough to receive more than one reward so we were struggling with our primary distribution; we wanted most of the food to be associated with the crate so we could quickly rebuild the behavior. So, when she would even step one foot in to the crate, we would call her out to the station and offer low value reinforcers outside of the crate and high value reinforcers inside the crate. The behavioral mass behind the station (outside of the crate) was so large

due to our history of primary distribution in that location that it acted as a reinforcer for her. Our otters are another example of when behavioral mass was important. They have a series of behaviors that they are asked frequently and therefore those behaviors are associated with large behavioral mass. These behaviors are great to fall back on after a missed cue or a challenging approximation session. They have a strong positive reinforcement history.

Lastly, it is important to identify a “safe” space. Where do you want your animal to go when they are scared or nervous? When a helicopter flies overhead where do you want your animal to run to? When a group of school kids runs at the stage screaming “I WANT TO TOUCH IT!!!” where should your animal go? This location might be a crate, back into its enclosure, to the trainer, up on a platform, or any other place where you are able to regain control of the situation while the animal is safe or partially hidden from the perceived danger. This location should always have the most behavioral mass and the strongest reinforcement history. The highest distribution of primary and secondary reinforcement should happen here. When we began working our African crested porcupine off leash at our stage we wanted her safe place to be her crate. If something spooked her while she was out on stage, we wanted her to know that running back stage and into the crate was the perfect choice. So, when she was first learning to be off leash on stage, we asked her to return to the crate numerous times for reinforcement. As the behavior progressed if we pushed our approximations too hard or far, or if large groups of people approached too close to the stage for her comfort, she would exit the stage and wait in the crate. She would still receive reinforcement for that and then we would set up our antecedents better on the following repetition.

In addition to the tools listed above the training team also spends time brainstorming challenges, addressing problem behaviors, and looking for new opportunities to build partnerships with our animals. We are also always certain that we are arranging our antecedents to set up our animals for success, admitting defeat quickly if we have set something up unfavorably, and thinking about tomorrow. We have a robust selection process for ensuring that animals we are acquiring are right for our program and that selection process also applies for hiring staff capable of handling the challenges that come with our training philosophy.

Conclusion

Animals that have confidence and are in control of their training allows us to serve our guests better because these animals have better temperaments, can remain under stimulus control for programming, and are able to be used more frequently without increasing stress. At the Aquarium we have used primary distribution to our advantage to heavily reinforce safe places, perches, and marks. We have offered choice and control to our animals and have worked to think of the presentation itself as a behavior and train all aspects .

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The Husbandry in Healing a Galapagos Tortoise (*Chelonoidis nigra*) after Leg Surgery

Lindsay Glass, Senior Zoologist - Hospital
Dallas Zoo

*Following rear leg surgery in March 2017 due to poor body conformation and an unwillingness to walk, 30 year old Galapagos tortoise (*Chelonoides nigra*) “#12” spent 15 months in Dallas Zoo’s A.H. Meadows Animal Health Care Facility under the care of hospital keepers. Responsible for daily wound treatments, husbandry, enrichment, and training, hospital keeper staff employed creative solutions to combat recovery challenges. Chief among these solutions were unique methods for encouraging proper mobility, changes of scenery for natural stimulation, stall modifications for a novel indoor experience, and a custom designed physical therapy regimen using operant conditioning in order to get this 250 pound adult prepared to return to habitat. By collaborating with multiple zoo departments, hospital keepers were able to tailor the husbandry to the patient and provide mental stimulation and enhanced quality of life by providing naturalistic opportunities that improved demeanor, increased interactions with his surroundings, and resulted in better wellness overall. By July 2018, the veterinary team was pleased with the wound healing and was confident in #12’s ability to ambulate correctly; he was discharged back to the care of the Reptile staff and returned to habitat with his 2.4 conspecifics.*

Introduction

On 20 March 2017, 30 year old Galapagos tortoise (*Chelonoidis nigra*) “#12” presented with rear leg lameness and a large callus on his rear right thigh, preventing him from walking upright. He was observed and treated by the Dallas Zoo vet staff in the Galapagos tortoise yard for a week and a half before being moved to the Zoo’s A.H. Meadows Animal Health Care Facility (hereafter called the hospital) for surgery. Due to the difficulties in maintaining a clean surgical site post-op, it was determined that #12 would stay in the hospital until the leg was fully healed, under the care of the hospital keeper staff. A wide variety of treatments and procedures occurred over a year and a half while #12 was under veterinary care, but the primary goals of the keepers remained unchanged: keep the wound site clean, provide the best possible care to insure a positive temperament, and maintain the upmost quality of life for the patient.

Treatments

Hospital keeper staff was responsible for daily care and wound treatments that consisted of hydrotherapy sessions on the wound site, followed by a topical such as Manuka [honey](#)^a or a chlorhexidine scrub^b and silver sulfadiazine (SSD) cream^c application. The use of hydrotherapy, disinfecting wipe, and cream to assist the granulation process was a set of treatments performed by the keepers for approximately 7 months. This kept the surgical site clean and clear of hay debris while other treatment options were explored. A much-anticipated V.A.C Freedom[®] Therapy System^d, a backpack-like device that aids in drainage using vacuum therapy, ultimately proved unsuccessful given the site’s proximity to the plastron, which prevented the vacuum from sealing completely. Subsequent treatments included MEDIHONEY[®] patches^e that were applied by the vets and changed approximately every 5 days. Honey applications were always paired with fly gel and keeper checks to ensure no fly-strikes. These were successful in closing the wound adequately

until there was no longer a deep enough pocket to pack with the patches. The final treatment plan utilized an Assisi Loop[®], a looped wire encased in plastic, which is placed around the wound. The loop created a targeted pulsed electromagnetic field within it aiding the healing process with increased blood and lymph flow as well as reducing pain due to the anti-inflammatory effects of the field (Rohde et al., 2009). Three 15-minute sessions a day with a minimum 2-hour break in-between treatments required the use of careful time management and note keeping to maintain the treatment schedule. After a 4-week trial run, the vets were satisfied with the healing quality (healthy muscle, good vessel formation, improved granulation, etc.) of the surgical site and opted to continue this treatment plan until #12's return to the tortoise habitat 8 months later.

Husbandry

Hospital staff consistently monitored, evaluated, and tailored the husbandry to fit the patient, including his mental health and quality of life. Although a tractable patient with a generally sweet disposition, #12 presented unique challenges as a reptile. Typically less expressive, with less visible stereotypic behaviors than their mammal counterparts, reptile mental health is still a new area of study (Warwick et al., 2013). #12 would spend a large portion of every day facing a stall corner, immobile. While not unexpected, the lack of engagement with his surroundings, enrichment, and keeper staff was not ideal. Additionally, when he would move, the body conformation and movement looked more like a sea turtle on land rather than a Galapagos tortoise walking. The decreases in locomotion, interest in diet, defecation, and energy became the target areas for change in his care.

After discussing options with the vets and hospital manager, the most important component of changing the behavior was getting #12 moving upright again. Given the extensive tissue removed during surgery, it was likely the leg was still experiencing discomfort and tenderness. A trash can dolly was easily accessible and considered the best prototype for assessing how his movement was being hampered by the surgical site. The dolly was attached to #12's underside and there was an immediate change in walking posture. With the dolly reducing the pressure on the rear leg, he was able to support himself with his front legs. It worked well enough that #12 took keeper-accompanied walks outside on nice afternoons. Unfortunately, this was only a temporary solution. The dolly detached from the tortoise daily. Until a more permanent solution could be found, #12 was dolly-less and back to his corners. One week later, half of a bowling ball was epoxied to his plastron just inside the rear right leg giving #12 the permanent boost he needed to stay off the ground.

Upon entrance into the hospital, staff worked with the Zoo's Animal Nutrition Team to adjust #12's diet for his stay. The original diet, offered triweekly, included a formulated tortoise chow, collard greens, kale, carrot, and fruit with a daily offering of coastal hay. During his period of extreme lethargy, the diet was modified to compensate for the lack of locomotion available to him in the hospital. The chow was removed and produce reduced by half, thus allowing keepers to tong-feed #12 while he was refusing his diet when presented on a tray.

Addressing #12's lack of appetite and zero waste output took some creative problem-solving and ultimately, a change of scenery. Across from the hospital is the building that houses the zoo's gorilla troops; along this building is a fenced-in garden measuring roughly 50 meters x 10 meters (165 feet x 32 feet) that is planted with browsable plants such as photinia (*Photinia x fraseri*), fig (*Ficus carica*), and grapevine (*Vitaceae spp.*). After consulting with the curatorial staff, animal teams, and vets, #12 was moved into this garden in June 2017, when the weather was consistently nice enough in Dallas that temperature parameters were reliable. The garden encouraged mobility and grazing, while exposing #12 to natural light cycles and summer rain. Hospital keepers continued to provide a water bowl and his diet. Walking while on the dolly, outside time, water-filled fruits, rides in the hospital van, soaking in an unused shark pool, and fluid injections from the technicians all failed to elicit any fecal production. A tank soak followed by an enema administered by the vets finally ended with results, but #12's constipation remained an ongoing issue for another 2 months. Although still not interested in eating his diet, #12 ranged over the garden (as evidenced by the marks of the newly attached bowling ball in the grass) and had access to all the available forage for his 3-week stay outside. The natural foraging became an important part of #12's daily care and hospital keepers collected a variety of browse from across the zoo and began offering it to #12 consistently (minimally 3x/week). Regular leafy browse and fluid injections (1 liter/2x week) kept #12 hydrated and resulted in consistent bowel movements from then on, complementing a final diet change that removed all fruit and roughly 1/3 of the greens

from the original diet to promote healthy weight management.

While being housed outside, a new treatment plan was developed for #12's healing leg. During his stay in the browse garden, #12 was lifted every other day for a 15 minute soak in a large shark tank, which replaced the hydrotherapy. Keeper staff scrubbed the wound site with chlorhexidine and applied SSD cream daily. Every 3 days, they lifted the tortoise for a thorough cleaning by vet staff.

To avoid falling into a monotonous routine once back inside, keeper staff worked hard to provide #12 with natural stimulation and enrichment to promote the increased activity levels seen while in the garden. Stall doors were opened to the enclosed yard outside when weather permitted. Constraints on time and manpower made it impossible to take #12 to the neighboring grassy areas for outside grazing on a regular basis given his large size and inability to walk, but this was achieved several times thanks to a modified exam cart, specifically designed for #12 and his bowling ball. As the weather cooled and there was no definitive end for #12's hospital stay, keepers got creative. In the adjoining hospital stall, 1.8 cubic meters of soil (63 cubic feet), 40 pieces of sod, and 7 suspended UVA/B lights transformed a 4m x 5m inside stall into a grass yard, connected via shift door to #12's usual residence. This injured that #12 would be provided with a stimulating space filled with natural forage all winter long.

The final piece to the quality of life puzzle presented by #12 was getting him to walk correctly again. Once back in the tortoise yard, he would need to ambulate correctly to cohabit with his 2.4 conspecifics. Unfortunately, after months of disuse, this ability had deteriorated. A physical therapy regimen designed by the hospital keeper staff was necessary to rebuild strength in #12's rear right leg and also provide sufficient motivation for him to walk upright. Using high value diet items such as produce and browse, the staff started rewarding small improvements such as placing his front feet in the correct conformation or raising himself off the bowling ball, which he had grown accustomed to resting on. A target pole was introduced and used to both increase the height at which he stood as well as the length of time standing. #12 adapted to the training right away and demonstrated that he had retained the necessary range of motion to walk correctly despite the surgeries. Physical therapy training sessions increased to 2-3 times every day to continue his strength-building and the approximations advanced to #12 taking several high-quality steps before reinforcement was given. Additionally, keeper staff made optimal use of time when he was not training to continue encouraging correct body conformation. This was achieved through use of a custom food stand built high enough off the ground to require standing and by hanging browse within the stall. These efforts continued with goals of #12 voluntarily walking himself to his weekly treatments and monthly weigh-ins, thereby reducing the need for reptile keepers to come to the hospital to assist in his transport, until he was discharged as a patient.

Conclusion

Recuperating reptiles can present unique challenges to the staff tasked with caring for them but the process can be extremely rewarding as well. Given the length of their recovery time, every effort should be made to consider all aspects of their well-being from treatment planning to the physical and mental quality of their life outside of their normal routine. This requires a collaborative effort across multiple departments, but the small improvements and demeanor changes during the convalescing period reaffirm the effort. On 10 July 2018, #12 was discharged back to the care of the Reptile Department and rejoined his 2.4 conspecifics on habitat with a welcome home party.

Materials

^aManuka Honey UMF® 16+, Manuka Honey USA, Orlando, FL 32835, <https://manukahoneyusa.com/>

^bNolvasan® Surgical Scrub, Zoetis Inc, Kalamazoo, MI 49007, <https://www.zoetis.com/>

^cSilver Sulfadiazine Cream, Ascend Laboratories, LLC, Parsippany, NJ 07054, <https://www.ascendlaboratories.com/>

^dV.A.C. Freedom® Therapy System, KCI USA, Inc, San Antonio, TX 78219, www.kci1.com

^eMEDIHONEY[®] Dressing, Derma Sciences, Inc, Toronto, Ontario M1S 3S4, <http://www.dermasciences.com/>

^fAssisi Loop[®], Assisi Animal Health LLC, Pinehurst, NC 28374, www.assisianimalhealth.com

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Using Behavioral And Physiological Data To Evaluate Animal Welfare In Marine Mammals: A Case Study On Polar Bears And Sea Otters

Nicole Nicassio-Hiskey, Candace Scarlata, Julie Christie, Amy Cutting, Jen DeGroot, Robert Draughon, Celess Edinger, Megan Hagedorn, Amy Hash, Renee Larison, Sara Morgan, Christina Parr, Michelle Schireman, Nadja Wielebnowski
Oregon Zoo

*In recent years, zoos and aquariums have increased their efforts to systematically evaluate and improve animal welfare. One tool that can be used for an objective assessment of physiological state is the monitoring of adrenal hormones in fecal samples. Since 2015, animal care staff at the Oregon Zoo has been collecting fecal samples from various animals/species for hormone analyses in our on-site endocrinology lab. The lab uses enzyme-immunoassay (EIA) techniques to track reproductive hormones like estrogen, progesterone and their metabolites, as well as adrenal hormones like cortisol, corticosterone and glucocorticoid metabolites. Monitoring glucocorticoid metabolites (GMs) in fecal samples provides a pooled estimate of adrenal hormone production for the previous several hours to days depending on the species and the respective rate of metabolization and excretion. Temporary increases in GMs can occur in response to negative or positive events and can be used to identify acute stressors and responses to novel stimuli, such as a new enrichment item. Long-term elevations of GMs may indicate the existence of a chronic stressor, such as an on-going health issue. When paired with detailed behavior data, hormone data can be used to help evaluate animal welfare, investigate responses to specific events or management decisions as well as facilitate end of life discussions. In this poster, we will discuss several examples in which paired hormone data and behavioral data were used to monitor animal welfare in 1.2 polar bears (*Ursus maritimus*) and 2.1 southern sea otters (*Enhydra lutris*).*

As defined by AZA, animal welfare refers to an animal's collective physical, mental, and emotional states over time and is measured on a continuum from poor to excellent. There is no simple test to assess an animal's welfare state and welfare outcomes may vary across individuals of the same species according to an individual's personality, history, rearing experience, gender, etc. In spite of variability across animals and species, research has shown that by providing certain standards of care we can improve and increase the opportunities for "good" welfare to occur. Appropriate nutrition, shelter, humane treatment, veterinary care, good management and the ability to perform a full range of innate behaviors are a few examples of basic standards. However, individual animals are unique and can respond differently to environmental factors like staff routines, social groups or health conditions. Ideally, animal care staff and animal welfare researchers need to work closely together to continually strive to provide opportunities for optimal welfare and evaluate the outcomes. The longitudinal study of an animal's behavior, physiology, physical health and longevity helps to guide these efforts and allows for regular assessments based on scientific evidence.

One way to physiologically evaluate welfare is through the monitoring of adrenal hormones, or glucocorticoids (GM). Glucocorticoids have also been termed "stress" hormones and help to mediate an individual's response to perceived or real stressors in the environment. Glucocorticoids are excreted by

the adrenal glands in response to stressful or existing events. However, glucocorticoids also assist in regulating body fluid homeostasis, maintenance of healthy glucose levels in the blood, daily activity levels and seasonal physiological changes. They exist within the body at constant low levels and undergo some daily and seasonal fluctuations specific for each species. Therefore, measures of glucocorticoids by themselves can be difficult to interpret and additional measures such as behavior observations are needed to distinguish between “eustress” (i.e., adaptive beneficial stress responses) and “distress” (i.e., negative and possibly detrimental stress responses and stressors).

The Oregon Zoo’s Wildlife Endocrine Lab uses enzyme-immunoassay techniques to measure hormones and their metabolites primarily in fecal samples. By using this non-invasive fecal sampling technique, baseline values can be calculated and tracked for an individual animal for an extended period. Short periods of elevated glucocorticoid values may occur during times of change like an animal transport or the meeting of a potential mate. Staff can use these data as a tool to better understand how an animal is coping or responding to these temporary changes. Extended periods of elevated glucocorticoid values can potentially be indicative of a long-term illness or health condition, especially in older animals. When combined with behavioral data, hormone data can provide keepers with independent physiological data and facilitate health discussions.

METHODS

Animals

The first step to setting up a hormone monitoring project is to determine which animals you want to monitor and why. Some animals are considered of higher priority because of their behavior, social needs, personality or management and it is often the husbandry staff that helps identify these animals. For this case study, we chose 1.2 polar bears (Conrad, Tasul, & Nora) and 2.1 sea otters (Eddie, Lincoln & Juno).

Tasul was a 31 year old female polar bear. Tasul took part in several conservation research projects beginning in 2013 until her death in 2016. The two final projects Tasul participated in required her to walk on a treadmill and swim in a metabolic chamber. The training was demanding at times and required staff to work Tasul daily toward advancing training goals. This was an enriching time for Tasul as it presented new opportunities for her to perform novel activities that were not historically part of her daily routine. Throughout Tasul’s training as well as during research trials, animal care staff collected Tasul’s feces in hopes to better understand the possible physiological impacts of her varying activities.

Conrad was a 31 year old male polar bear. In 2016, he began showing signs of inappetence and episodes of malaise. It was later, during an anesthesia procedure, staff learned Conrad’s liver had a large tumor on the caudate lobe. Due to Conrad’s advanced age and the size and location of the tumor, surgery was not deemed to be a safe option. A quality of life monitoring system was initiated, and his appetite, behavior and mobility were regularly assessed. Veterinary staff communicated to husbandry staff that large tumors like Conrad’s could compromise the function of other abdominal organs and cause discomfort. Husbandry staff focused their efforts on keeping Conrad comfortable and feeding him preferred food items. Staff had already been collecting marked fecal samples and staff was hopeful that by tracking Conrad’s glucocorticoid levels, along with detailed behavior data, his health and well-being would be closely monitored. Conrad’s health and activity continued to decline over the next several months and eventually he was humanely euthanized. Although the final glucocorticoid data was not available prior to staff making the decision to euthanize Conrad, it was available post death and confirmed our observations that Conrad was increasingly uncomfortable, and his adrenal activity indicated a chronic stress response.

At the time of our study, Nora was a 9-month old, female polar bear. Nora was scheduled to leave the Columbus Zoo after being hand raised by animal care staff since she was approximately two weeks of age. Nora was transported to the Oregon Zoo at nine months of age and was immediately placed into a new habitat, introduced to new staff, and eventually introduced to a 31 year old female polar bear for companion-

ship. To monitor her transition from one facility to another, fecal samples were collected before and after she was moved, and detailed behavior notes were kept on Nora throughout her entire transition. The pre-transfer samples from the Columbus Zoo enabled us to establish and understand Nora's baseline glucocorticoid levels in a familiar environment. Both zoos worked together and collected fecal samples and detailed behavior notes on Nora to allow for the monitoring of her transition and acclimation.

Eddie was a 20-year old male Southern sea otter. At the age of 16, Eddie was diagnosed with arthritis and received medication for inflammation and pain. Over time, staff noticed his mobility on land slowing and he was becoming stiffer. Although he consistently took his medication, Eddie did go through periods where he would show food preferences or avoid approaching staff at meal time. Missing a meal is highly unusual for a sea otter as they require large quantities of food each day. Over time, his mobility and speed worsened. At nineteen years of age, radiographs revealed severe degenerative joint disease (DJD) in his pelvis, abnormal bone density in his femurs and several spinal lesions. Eddie's medication regime was changed, and this seemed to improve his mobility for a couple of months. To better evaluate Eddie's health, he was examined under anesthesia in his final year of life. Staff was able to monitor his GM levels over this time period.

Juno is a wild born five-year-old Southern sea otter. She has been housed with various sea otters at two different facilities, including the Oregon Zoo. When Juno arrived in Oregon, she was five months old and easily integrated in with our older female and male. Right away, the older female behaved maternally toward Juno and continued to do so until her death. Juno remained with the older male otter, Eddie, until Lincoln was introduced into the group. Initially Juno showed little interest in Lincoln but eventually became extremely maternal toward him. Lincoln and Juno continue to have a very strong bond today. In order to see how social changes would affect Juno, we decided to monitor GMs in combination with some behavioral observations. Otters are known to develop stereotypic behaviors during times of change and stress, and we wanted to make sure to be aware of possible negative changes in order to help counter act them as needed.

Lincoln is a sea otter pup that was found stranded in California and hand reared at the Monterey Bay Aquarium. The first four months of Lincoln's life were spent solely with human caretakers. It was not until he was integrated into the sea otter collection at four months of age at the Oregon Zoo that he gained experience and time with other sea otters. Wild sea otter pups learn everything from watching and mimicking their mom's behavior. Once Lincoln was able to spend time with Juno and Eddie, he could observe and mimic natural behaviors like grooming, pounding open shelled prey items and manipulating enrichment devices. Collecting fecal samples from Lincoln allowed staff to monitor Lincoln's responses to social interactions and experiences during an important developmental time.

Fecal Collections

The next step to setting up a hormone monitoring project is to collect fecal samples from your animals. In general, keepers should try to collect about 2 grams of fecal matter in a consistent fashion. Samples should be as fresh as possible and should not be urine-contaminated. Also, if an animal defecates several times a day, collecting samples at the same time is important (e.g. always in the early morning or mid-afternoon) to avoid the impact of potential diurnal glucocorticoid fluctuations on the hormone data. Each fecal sample should be sealed in a Zip-lock bag, labeled using a permanent marker with the date and animal's name, and stored in a freezer until analysis. Once enough fecal samples have been collected, they can be sent to the endocrinology lab for analysis.

One challenge with collecting fecal samples is getting consistent samples. Some animals have large amounts of debris in their samples like shrimp shells or hair. Samples need to be large enough so that debris can be removed, and enough sample remains for analyses. In addition, some samples vary widely in water content (i.e. wetness) from day to day. If this is the case, samples will need to be dried in an oven or freeze-

drier to eliminate this variability before processing.

Another challenge can be establishing a consistent collection schedule. Ideally, samples should be collected daily or every other day in order to establish a baseline and to capture any responses to changes in the animal's environment. Sea otters naturally defecate in the water and most commonly do so during or immediately following a feeding session. To enable staff to collect fecal samples from 2.1 Southern sea otters at the Oregon Zoo, staff trained the sea otters to defecate during training sessions. To train this behavior, staff introduced a 6-inch square, fine mesh fish net attached to a long PVC pole. At each feeding session, the keeper held the fecal net and pole close to the sea otter. A verbal cue "Go Potty" was repeated during the training session as the keeper extended the pole toward the otter. If the sea otter defecated, the animal was strongly reinforced with praise and food rewards. The keeper was then able to collect the fecal sample from the water column as the otter ate nearby. This training method has become so successful that the presence of the fecal net near the sea otter often prompts defecating and allows collection on a consistent schedule.

A different challenge is identifying which animal defecated which sample. At the Oregon Zoo, staff have had success feeding chopped vegetables like corn and carrots to 1.2 polar bears. The polar bears readily ate these fecal "markers" when they were mixed into a ground meat diet. Fecal samples were then collected during routine exhibit cleaning the following day. For animals that may not consume vegetables, other markers such as food coloring or brightly colored craft beads or glitter have been used with success (Read Fuller et al. (2011) for more information).

Hormone Analysis

Extraction of hormones into a solution

For polar bear samples, 0.5 ± 0.025 g of wet, homogenized fecal material was mixed with 2.5 ml of 80% methanol, vortexed for 10 seconds and shaken overnight (~17 hours) on a mechanical rocker. In the morning, the extracted samples were centrifuged at 2500 rpm for 15 minutes and the supernatant was stored in 12 x 75 mm tube at -20°C until analysis. Next, 500 μl of the supernatant was dried in a speedvac and re-constituted in 500 μl of Tris assay buffer before dilution to eliminate any potential effects of methanol interference with the EIA.

For sea otters, samples were dried in an oven drier at 60°C for 24 hours and then were crushed and sifted through a fine mesh to remove debris like shrimp shells. Next, 0.10 ± 0.02 g of dry fecal powder was mixed with 1 ml of 90% methanol, vortexed for 10 seconds and shaken overnight (~17 hours) on a mechanical rocker. The extracted samples were centrifuged at 2500 rpm for 15 minutes and the supernatant was stored in 12 x 75 mm tube at -20°C until analysis.

Enzyme-immunoassay (EIA)

Fecal glucocorticoid metabolites were measured using the Arbor Assays EIA Cortisol Mini-kit (Catalog# ISWE002) that used a cortisol antibody (C242, 1:60 dilution) and HRP conjugate (1:50 dilution) with a 96-well plate coated with goat anti-rabbit IgG (0.01 mg/ml, Arbor Assays). To obtain the standard curve, cortisol was serially diluted to make 10 standards in the range from 0 – 3200 pg/ml. Intra- and inter-assay coefficients of variation were less than 10%.

The glucocorticoid EIA was biochemically validated by demonstrating: 1) parallelism between binding inhibition curves of dilutions of fecal extract and the corticosterone standard curve; and 2) significant recovery of exogenous cortisol added to fecal extracts.

Biological Validation

In addition, our assay was biologically validated for each species to verify that the changes in glucocorticoid values were showing us biologically relevant information (i.e. is our assay able to detect a rise in stress hormones after a stressful event). There are two common methods for biological validation.

One method is to collect fecal samples before and after a known stressor, such as a medical exam or the transfer of an animal between facilities and determine if the assay shows a significant increase in GMs shortly after the stressful event. For example, in Eddie's graph (Graph 6) we saw a large spike in GMs in the first sample collected after a medical procedure. In addition, we saw elevated GMs in Nora (Graph 1) the day after she was transferred to a new facility.

Another method is to perform an Adrenocorticotrophic Hormone (ACTH) challenge. For most mammals, the injection of a synthetic ACTH compound will cause a temporary hormonal stimulation of the adrenal gland, which will in turn secrete glucocorticoids into the bloodstream. These glucocorticoids will then be broken down by the liver and excreted in the urine and feces. If valid, the glucocorticoid assay should be able to detect a significant increase in fecal glucocorticoid metabolites within 48 hours of the ACTH challenge. The St. Louis Zoo was able to share with us samples that were collected from 3 polar bears during an ACTH challenge. Using our EIA methods, we saw a 2.5-fold increase in samples collected between 7-24 hours post- ACTH challenge. These results provide us with both a physiological validation of this assay and an estimate of the lag time between the release of glucocorticoids into the bloodstream and the excretion of its metabolites in the feces.

Data Analysis

For each animal, we calculated 2 glucocorticoid values: 1) Baseline Mean and 2) Elevated Threshold. Baseline mean is an estimate of an individual's average glucocorticoid output during non-stressful events. Baseline mean is calculated by an iterative process where all values that are 2 standard deviations above the mean are deleted until no values exceed two standard deviations. This process removes all "elevated" samples from the calculation and allows us to get a better estimate of the animal's basal adrenal activity. The elevated threshold is calculated as the baseline mean plus two standard deviations. This value provides a visual delineation on the graph and any data point above this line is considered elevated.

Care should be taken when comparing these values among animals. Individual or gender differences in hormone secretion and metabolism can result in different baseline glucocorticoid concentrations. For example, on average, Conrad had lower glucocorticoids concentrations than the two female polar bears, but this may be due to gender differences and is not necessarily a statement about any real differences in perceived stress levels. In fact, in many mammalian species, it is common for females to have a higher glucocorticoid baseline than males. Also, for Eddie we only had 33 samples, of which none were collected before he became ill, so his reported baseline only reflects adrenal activity over the last 6 months of his life and is likely to be elevated relative to his "healthy/normal" baseline.

Chart 1. Baseline mean and elevated threshold values (ng/g) for three polar bears and three sea otters in our study.

Polar Bears	Baseline	Threshold	Sea Otters	Baseline	Threshold
Nora	37.5	71.2	Juno	46.6	105.8
Tasul	37.1	65.9	Lincoln	32.9	66.5
Conrad	22.5	39.0	Eddie	131.9	262.4

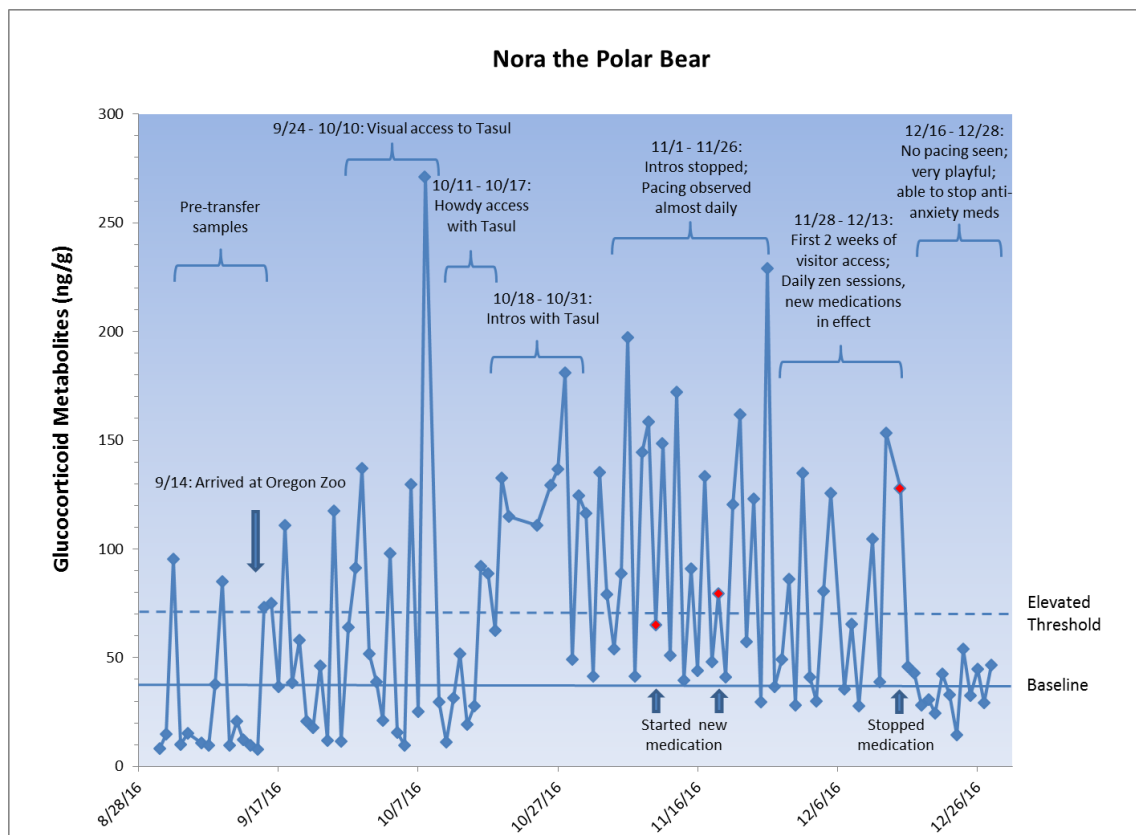
Benefits of Hormone Monitoring for Animal Welfare:

The case studies below illustrate how noninvasive hormone monitoring, in combination with behavioral

data, can be used to assess the impact of management changes and responses to varying stressors. Specifically, we will explore how hormone monitoring can help: 1) monitor an animal's acclimation to a new exhibit and new social interaction, 2) evaluate the response to new enrichment and training, and 3) monitor long-term health issues.

1. Monitoring an animal's acclimation to a new exhibit and new social interactions.

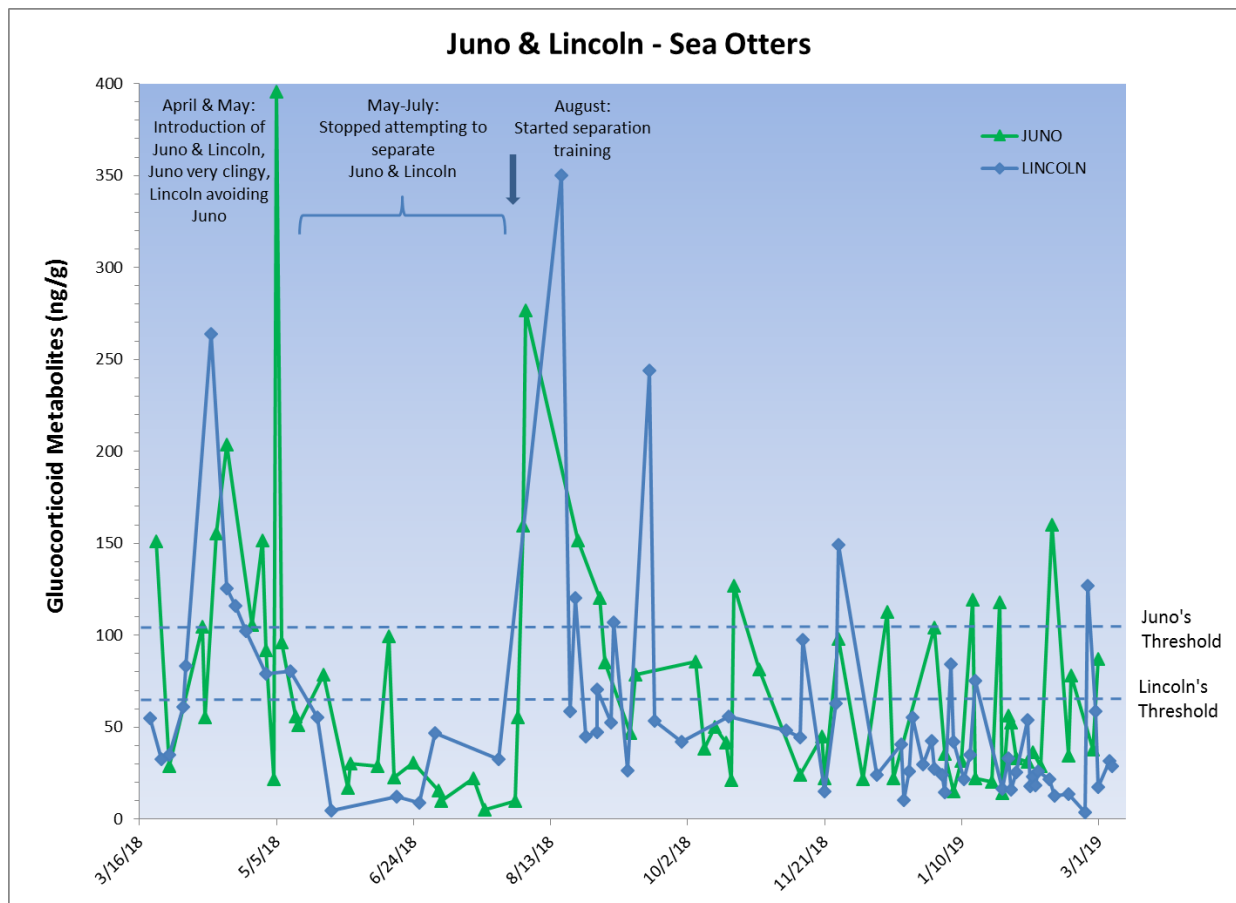
Transporting and transferring animals to new zoos and or new exhibits is a common occurrence as part of population management within the AZA community. It is known that these events represent a substantial stressor for the animal, yet the stress associated with such moves should usually be relatively short-lived, depending on the type of transport, pre- and post-transport management and the animal's temperament. It is important to monitor transport stress and post-transport acclimation in order to better understand how individual animals cope. This allows us to determine what management changes can best mitigate stress during transport, acclimation and beyond. In the following examples, we present data on a young polar bear and sea otter who were transferred to the Oregon Zoo and introduced to conspecific animals for the first time.



Graph 1. Nora's GM values during her transition to the Oregon Zoo as well as her response to a new social interaction with a polar bear. Red dots on graph indicate starting of new anti-anxiety and anti-depression medications and stopping of anti-anxiety medication (on 12/15) in that order. Solid line = Nora's baseline. Dotted line = Nora's elevated threshold. Values above the dotted line are considered "elevated."

Nora is a hand-reared, female polar bear who was transferred to the Oregon Zoo in September 2016 and introduced to her first polar bear in October 2016, when she was 9-months old. She had elevated GM levels during her initial transfer and acclimation to the new exhibit, but by 30 September, she seemed to acclimatize and most of her GM values were near baseline. In October, we began introductions with polar bear Tasul. Potentially, because Nora was hand-reared and had no real-life experience with another polar bear,

her behavior and GM values changed dramatically during this period. Before introductions, Nora was a playful cub that would engage with keeper staff, swim playfully, interact with enrichment and at times throw toddler-like temper tantrums. During and after introductions, Nora began pacing excessively, even if Tasul was not nearby. When Tasul did approach her, Nora would “freeze” for extended periods of time. Based on both behavioral and hormone data, it was apparent Nora found introductions to Tasul extremely stressful. Unfortunately, Tasul became ill and had to be humanely euthanized several weeks into introductions. Even though Tasul was absent, Nora’s behavior did not return to the calm, playful cub she was before introductions, so staff decided to prescribe Nora anti-anxiety and anti-depression medications. In addition, staff began a formal training and enrichment program to address her anxiety. In mid-November, staff began daily “Zen” training sessions. “Zen” sessions had been shown to help other high-anxiety animals become calmer and is a technique that had been used successfully at the San Diego Zoo. By mid-December, the “Zen” sessions, training program and medication seemed to be having a significant effect on decreasing her anxiety and Nora showed a corresponding decrease in her glucocorticoid values. In summary, these data showed that Nora was initially having difficulty acclimating to her new environment and allowed keepers to track the effectiveness of new management techniques that were initiated to help alleviate Nora’s anxiety.



Graph 2. GM data for sea otter’s Lincoln and Juno and their responses to new social situations and to being separated from one another. Dotted lines represent each animal’s elevated threshold. Values above this line are considered “elevated.”

Lincoln is another example of an animal who was hand-reared and went through a period of adjustment as he was exposed to new animals and experiences. Sea otter pups in the wild are completely dependent on their mothers for the first six weeks of life and typically remain with their mother for five to six months after birth. However, because Lincoln was hand-reared, it was not until he was four months old when he was introduced to his first sea otter, Juno. At first, Lincoln actively avoided interacting with Juno. He often re-

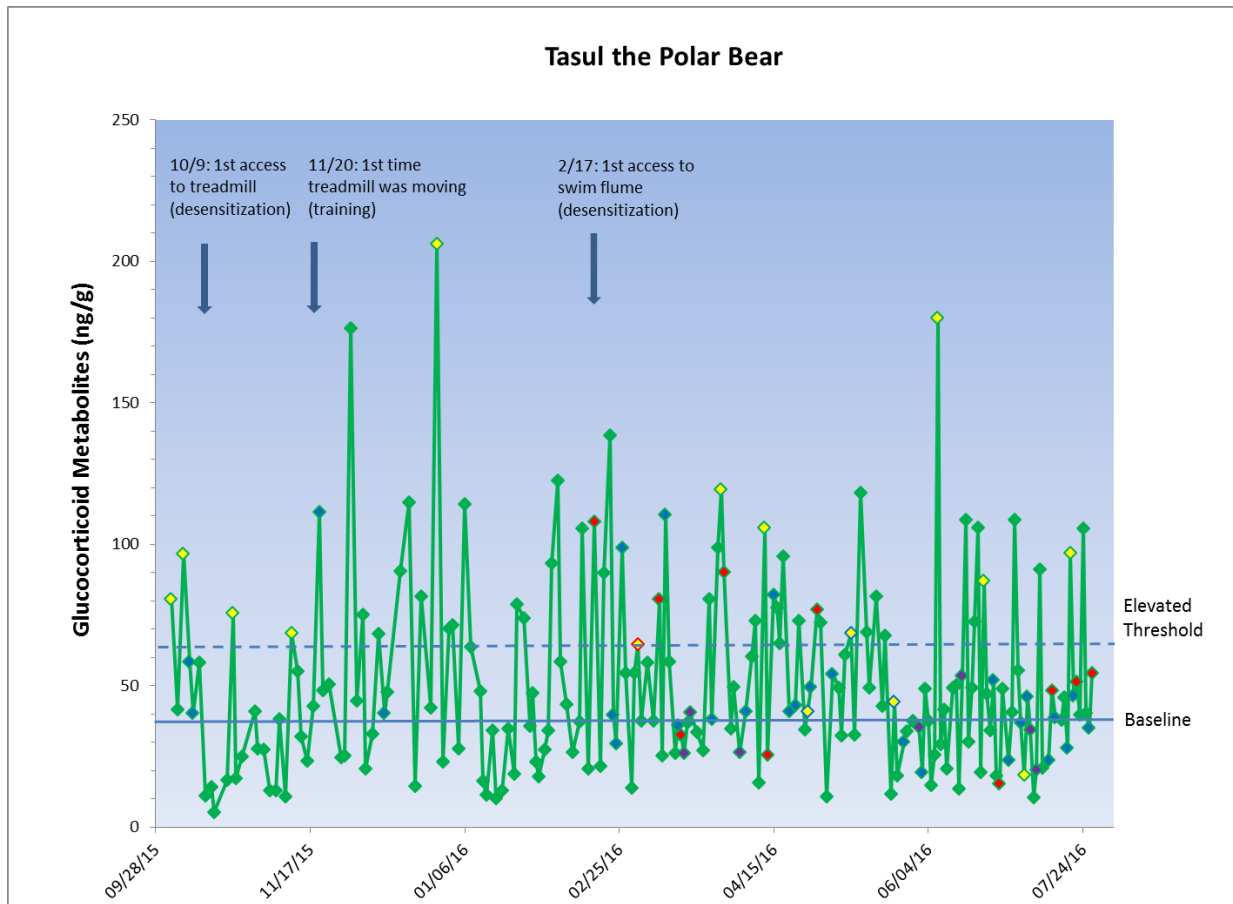
treated and paced on the deck which caused small abrasions on his rear flippers. These wounds were routinely examined by the veterinary staff and required weekly physical examinations. It took Lincoln over one month to adjust and become comfortable being with another sea otter. In contrast, Juno's reaction to Lincoln was much more maternal and clingy. She carried him around and helped him explore new enrichment and areas of the exhibit. She kept a watchful eye on him during training sessions and often offered him her food. Even when Lincoln would try to be independent, Juno did not allow Lincoln to travel too far away from her.

For management purposes, staff typically separate the sea otters so they can be fed independently. This allows the otters to dive, forage and eat at their own pace. However, during the initial introduction phase, Juno had a very strong reaction to being separated from Lincoln. She would loudly vocalize and frequently stop eating. In response to Juno's reactions, staff stopped separating Juno and Lincoln in May. Over the next two months, the otters became more comfortable around each other and the staff observed voluntary separation between the two. This opened up the opportunity to begin a long-term separation training program that would slowly desensitize the two otters.

Pairing Juno and Lincoln's behavioral data with their hormone data was extremely helpful and allowed keepers to better understand the sea otter's responses to the introduction and separation training. In April and early May, Lincoln was interacting with sea otters for the first time while Juno was behaving very maternal and resisted being separated from Lincoln. During this time, we saw elevated GM concentrations in both otters in response to these new social interactions. In May, keepers discontinued separating Juno and Lincoln and as they became more comfortable with each other, both their GM concentrations decreased to baseline. In August, keepers resumed separation training and there was a temporary increase in GM concentrations in response to this training, but once both otters were more acclimated to the separation, GM concentrations returned to baseline. Overall, these hormone data provided keepers with physiological evidence that the animals were able to acclimate to new social experiences, whether it was the introduction or separation of a new animal.

2) Evaluating the response to new enrichment and training.

Glucocorticoids are released to mobilize energy (as part of the fight-or-flight system), so high intensity activities like running or swimming can also activate the adrenal system. As a result, positive events like enrichment or training can also lead to a temporary spike in GMs. GM monitoring allows us to identify temporary physiological responses to different types of enrichment and medical procedures and helps us better understand each animal's response and desensitization to different potential stressors. Because of the 6 to 24 hour time lag between the secretion of glucocorticoids into the bloodstream and the excretion of its metabolites into the feces, we considered GM values to be an estimate of the physiological response to events from the previous day.



Graph 3. Tasul's GM response to treadmill and swim flume training as well as several medical treatments. Blue dots = GM response to treadmill training; Purple dots = GM response to swim flume training; Red dots = GM response to overlapping treadmill and swim flume training; Yellow dots = GM response to specific medical issues including paw wound (10/3 & 12/28), suture removal (10/7), blood draw (11/11) or allergy injections (3/2, 3/15, 3/29, 4/12, 4/26, 5/10, 5/24, 6/7, 6/22, 7/20). Solid line = Tasul's baseline. Dotted line = Tasul's elevated threshold. Values above the dotted line are considered "elevated."

Beginning in October 2015, polar bear Tasul participated in a research study that required her to walk on a treadmill and swim in a metabolic chamber. In order to train her to use the equipment, she was slowly desensitized to different aspects of the machinery before official research trials began. First, she was given access to the equipment to explore and become familiar with it. She was reinforced with food rewards whenever she entered the treadmill or swim flume. Once she was comfortable entering on her own, staff began turning on the motor or shutting the door to the apparatus. Between 1 October and 30 July, Tasul participated in 55 treadmill training sessions and 21 swim flume training sessions, 12 of which occurred on the same day.

During this time, Tasul had a medical treatment for a wound, a voluntary blood draw and received regular medical treatments for allergies and pyoderma. To treat her allergies, Tasul would voluntarily enter a training crate and align for a single injection, but Tasul was frequently hesitant about receiving these injections. Based on hormone data, her GM concentrations were elevated after both medical treatments as well as for 6 out of 10 (60%) days in which allergy shots were administered. Although, not all allergy shots resulted in a significant increase in GMs, data suggest that receiving an allergy injection may have affected her GM concentrations, so days in which Tasul received a medical treatment or allergy injection were not included in the enrichment study.

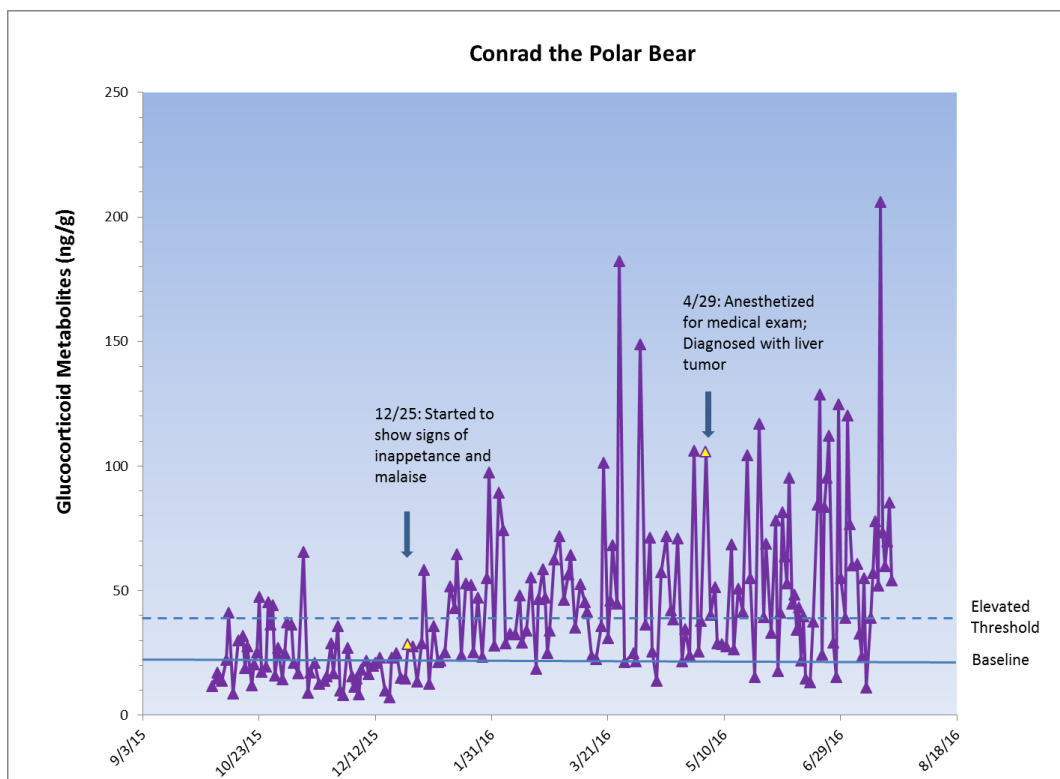
Tasul was first given access to the treadmill on 8 October and trials with the motor on began 20 November. Her initial exploration of the treadmill did not result in elevated GM concentrations (See GM values for 9 and 10 October); however, she showed elevated GM concentrations for several of the initial training ses-

sions where the treadmill was moving (five out of the first eight treadmill trials). Over time, staff saw improvement in Tasul's willingness to walk on the moving treadmill as well as a decrease in her GM response.

The swim flume was first filled with water on 17 February and trials with the motor on began on 8 March. For swim flume training dates, staff did not see any elevated GM responses unless they occurred on the same day as early morning treadmill training sessions suggesting a minimal stress response to the swim flume. By May, there were no elevated stress responses to treadmill training, even if they occurred on the same day as swim flume training. These results suggest she had acclimated to the treadmill and was ready for official research trials.

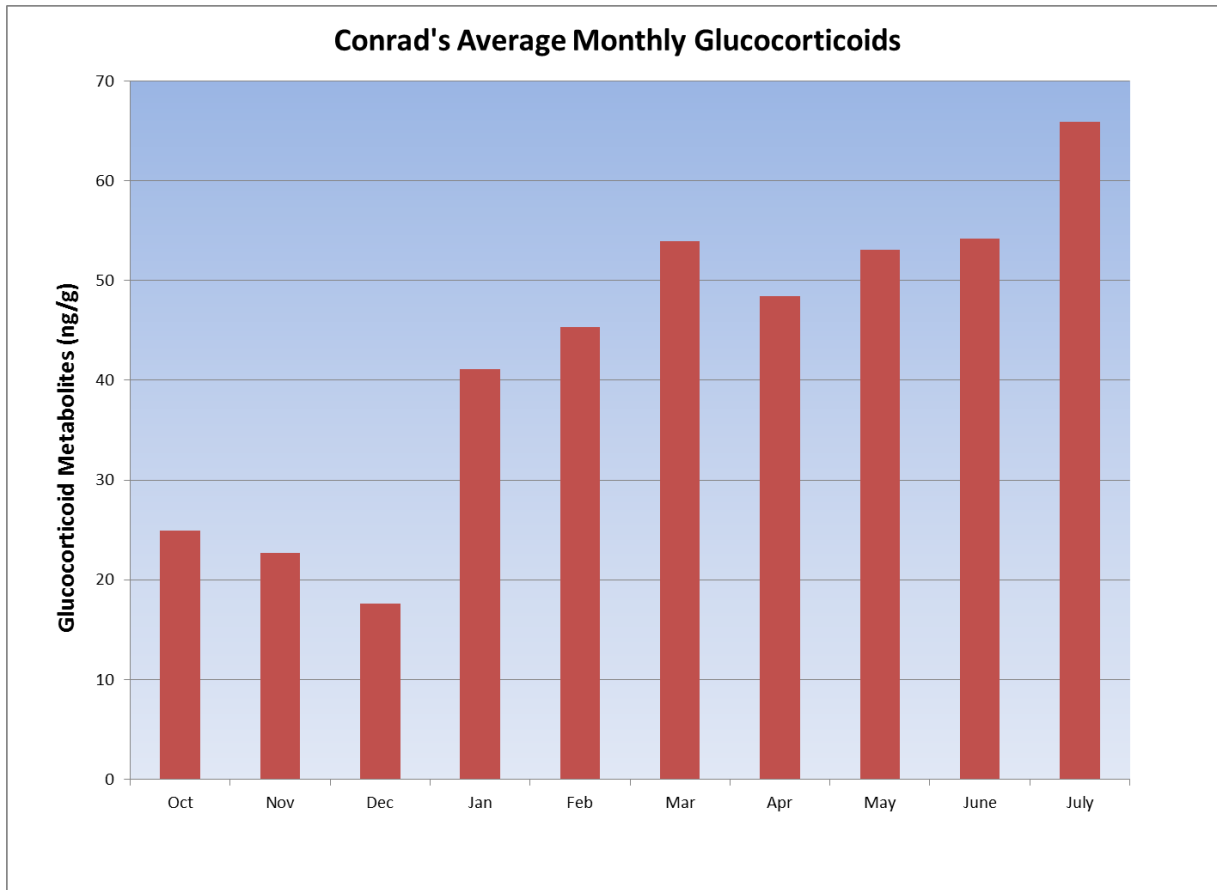
3) Monitoring Long-term Health Issues

Long-term health conditions, especially when they include pain, can add additional stress and discomfort. In addition, other medical procedures that involve animal restraint, injections or anesthesia can be stressful events for many animals. Monitoring glucocorticoids longitudinally in older animals can assist staff in determining if health issues or medical procedures are causing elevated stress levels and facilitate end of life discussions.



Graph 4. Conrad's GM profile for the last 10 months of his life. Solid line = Conrad's baseline. Dotted line = Conrad's elevated threshold. Values above the dotted line are considered "elevated."

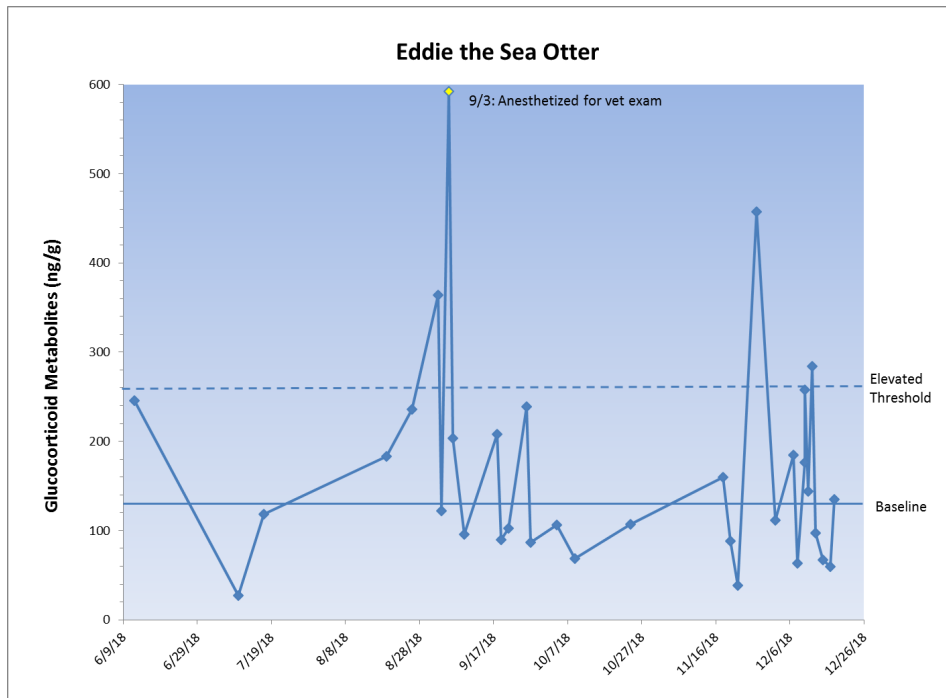
Conrad was a 31-year old male polar bear who was monitored longitudinally for 10 months to see if he was displaying any signs of chronic stress related to his age and health (Graph 4). From October to December 2015, Conrad's health was good, and his GM values were at baseline. On 25 December, staff began observing signs of inappetence and malaise with his GM values slowly increasing. At the end of April 2016, Conrad was diagnosed with a liver tumor during a medical exam and over the next few months staff saw increasing signs of discomfort and pain. By the end of his life, Conrad started to show behavioral signs of distress (lethargy, breathing heavily) and these signs were accompanied by a sustained elevation of GMs.



Graph 5. Average GM values by month for Conrad the polar bear.

Another way to track changes is to look at monthly GM averages (Graph 5). By the final month of his life, Conrad's GM average had more than doubled, indicating stressors consistent with chronic health issues.

Another animal staff monitored for long-term health issues was Eddie. Eddie was a 20 year old male Southern sea otter who was diagnosed with arthritis at 16 years of age. To help evaluate his welfare, Eddie was placed on a quality of life program at the zoo. Each month, he was evaluated in several areas: his mental ability, disposition, mobility and activity level, and interaction with enrichment. These evaluations allowed staff to carefully track any changes, especially in his mobility. Near the end of August, staff noticed Eddie's behavior changed. He began showing food preferences, was avoiding keepers and stopped shifting consistently. These were all highly unusual behaviors for Eddie. Eddie was anesthetized on 3 September for a physical examination and recovered slowly over a one to two-week period. Following this exam, his medication regimen changed. On 11 September, he received the final dose of his previous medication and two days later he started a new drug treatment for pain. Staff observed improvement in his appetite, behavior and energy level. This improvement lasted for several months. In November, Eddie began showing food preferences again and was spending extended periods of time in pools of ice. In his final days, his behavior, appetite and health continued to decline, and Eddie was observed having labored breathing. Eddie was humanely euthanized on 20 December.



Graph 6. Eddie's GM profile for the last 6 months of his life. Solid line = Eddie's baseline. Dotted line = Eddie's elevated threshold. These lines represent his post-diagnosis GM levels and do not reflect healthy/normal baseline values.

During this time period, we monitored his GM concentrations to see if his values were increasing and to see how his baseline compared to other sea otters (Graph 6). Compared to sea otters Juno and Lincoln, his baseline was almost three times higher (Chart 1), suggesting the possibility of chronic stress related to his health issues. It is important to note that we did not have any hormone data from him prior to his medical issues; thus, his baseline represents post-diagnosis GM levels and does not reflect healthy/normal baseline values. In September, Eddie was examined under anesthesia and there was a large spike in GMs the following day. This tells us his adrenal system was still working and our assay was able to detect a rise in GMs after a stressful event. At the end of November, staff began seeing increased GM concentrations in Eddie, suggesting possible distress and confirming staff observation about his decline in health. In the end, if behavioral observations suggest that underlying health issues may be causing distress to an animal, hormone data can provide keepers with independent physiological data to support these conclusions and thereby facilitate end of life discussions.

Conclusion

As illustrated by these case studies, longitudinal GM monitoring can provide useful information for a variety of situations. Whether it is monitoring a young animal who is undergoing a new social experience or an older animal who is having health issues, these data can provide important information for the management of our animals. Specifically, it can show if animals are properly acclimating to a new exhibit, new social experience, new enrichment device or new health issue. If the animal is failing to acclimate, these data can determine what management changes were successful at alleviating the problem or facilitate end of life discussions. In conclusion, the combination of detailed behavioral observations and longitudinal stress hormone monitoring has great potential as a tool for improving animal welfare.

For more information about hormone monitoring and animal welfare, here are some good review papers:

Amaral, R. S. (2010) Use of alternative matrices to monitor steroid hormones in aquatic animals: A review. *Aquatic Mammals*, 36 (2), 162-171.

- Fuller, G., Margulis, S. W., & Santymire, R. M. (2011) The effectiveness of indigestible markers for identifying individual animal feces and their prevalence of use in North American zoos. *Zoo Biology*, 30 (4), 379-398.
- Mostl, E. & Palme, R. (2002) Hormones as indicators of stress. *Domestic Animal Endocrinology*, 23, 67-74.
- Palme, R. (2005) Measuring fecal steroids: Guidelines for practical application. *Annals of the New York Academy of Sciences*, 1046 (1), 75-80.
- Palme, R., Touma, C., Arias, N., Dominchin, M. F., & Lepschy, M. (2013) Steroid extraction: Get the best out of fecal samples. *Wiener Tierärztliche Monatsschrift – Veterinary Medicine Austria*, 100, 238–246.
- Sheriff, M. J., Dantzer, B., Delehanty, B., Palme, R., & Boonstra, R. (2011) Measuring stress in wildlife: techniques for quantifying glucocorticoids. *Oecologia*, 166, 869-887.
- Wielebnowski, N. (2003) Stress and distress: evaluating their impact for the well-being of zoo animals. *Journal of the American Veterinary Medical Association*, 223 (7), 973-977.
- Wielebnowski, N. & Watters, J. (2007) Applying fecal endocrine monitoring to conservation and behavior studies of wild mammals: important considerations and preliminary tests. *Israel Journal of Ecology and Evolution*, 53 (3), 439-460.

Thinking Outside The Captive Wolf Management Box

Gaby Dufresne-Cyr

Dogue Shop/Parc Safari Africain

*Recent studies have demonstrated that the dog (*C. familiaris*) has the ability to interpret and understand human emotions (Udell, Dorey & Wynne, 2010 and Guo, Meints, Hall, Hall & Mills, 2009) which confirms humans and dogs form attachments. The human-animal bond is documented in Animal-Assisted Therapy (AAT) literature (Fine, 2006) as an inter-species connection which has the potential to promote human physical and psychological health. Anxiety, autism, Alzheimer, and learning disabilities are some of the conditions improved with AAT programs. Furthermore, positive physical results include a reduction in blood pressure, heart rate, and triglyceride levels (Barker and Dawson, 1998). Potential negative outcomes of AAT programs are thought repression, cognitive distraction, and reduced empathy; consequently, therapists can expect increased session numbers. The creation and development of the wolf animal-assisted therapy (WAAT) pilot program served to establish a positive attachment between participant and wolf in order to increase communication skills, improve self-esteem, and enhance empathy. During sessions, participant perception of wolves as dangerous predators decreased; conversely, an empathic connection established the desire to protect wolves through conservation efforts. As discussed by Guo et al. (2009), wolf reactivity to humans diminishes with exposure. WAAT is the ultimate management, training, conservation, enrichment, and therapeutic program for both human and animal. This innovative program has the potential to reduce both wolf and human undesirable behaviours, develop effective management and training strategies, promote conservation efforts, and overall enrich each other's lives.*

Dogue Shop created the wolf animal-assisted therapy (WAAT) pilot program to improve social skills for at risk teens and promote wolf conservation. Collaboration between Carrefour Jeunesse Emploi (CJE), English Montreal School Board (EMSB), Parc Safari Africain zoo (PSA) and Dogue Shop (DS) made the animal-assisted therapy (AAT) curriculum possible. Interviews were conducted to select candidates. Once chosen, participants were handed pre-program evaluation forms to assess knowledge and social skill sets. Post-program evaluation documents and interviews were conducted to gather data on session design and implementation. Program goals were to establish and maintain inter-species attachment between human and wolves through social-cognitive and problem-solving training exercises in order to facilitate human social skill development, provide enrichment to wolves, and promote wolf conservation efforts.

WAAT demonstrated a significant improvement in social-cognitive skills such as communication, confidence, and attachment towards people and wolves. Participants reported their wolf conservation implication nearly doubled after the WAAT program, and continued to impact their daily lives six months later. The following paper will discuss animal-assisted therapy, the inter-species attachment model as a social-cognitive learning process, to facilitate enrichment, promote conservation efforts of exotic animals, namely wolves, and to improve human interpersonal communication skills. Finally, I will discuss the successes and short comings of the WAAT program.

Human Animal-Assisted Therapy Program Overview

Disadvantaged adolescents are in dire need for innovative social services and outreach programs. According to the National Crime Prevention Center (Public Safety Canada, 2012), 2.2 million people in Canada are aged 15-19-years-old; 8.5% of adolescent populations are high school drop outs without a high school diploma. The highest unemployment rate in Canada involves 15-24-years-olds; 15% of teenagers are unemployed compared to 7% for the adult population. In Quebec, 423 000 teenagers aged between 15 and 19 years of age (Institut de la Statistique Québec, 2016) share an annual deficit of 2\$ million from the Social Services Quebec ministry (Gouvernement du Québec, 2016). Consequently, the adolescent age group is rarely allocated large sums of money to promote social skill development and social reinsertion programs.

The lack of social programs for adolescents led to the research and development of the WAAT program. Research on animal-assisted therapy programs is well documented and offers promising results. According to Turner et al. (2009), “The results of this study indicate that the dog-assisted group training improves the emotional competences of the participants [adolescents], especially concerning emotion regulation and recognition” (p. 93). Gail Soobrayan Sentoo concluded her master’s research by saying “In line with the findings of other studies already mentioned in the literature chapters, this study showed improvement in the self-esteem of the subjects through the implementation of animal-assisted play therapy” (2003). AAT does seem to convey a sense of control to participants through object transference: the leash, treats, and clickers. The perceived sense of control instils a subjective power, which in and of itself, can increase self-esteem.

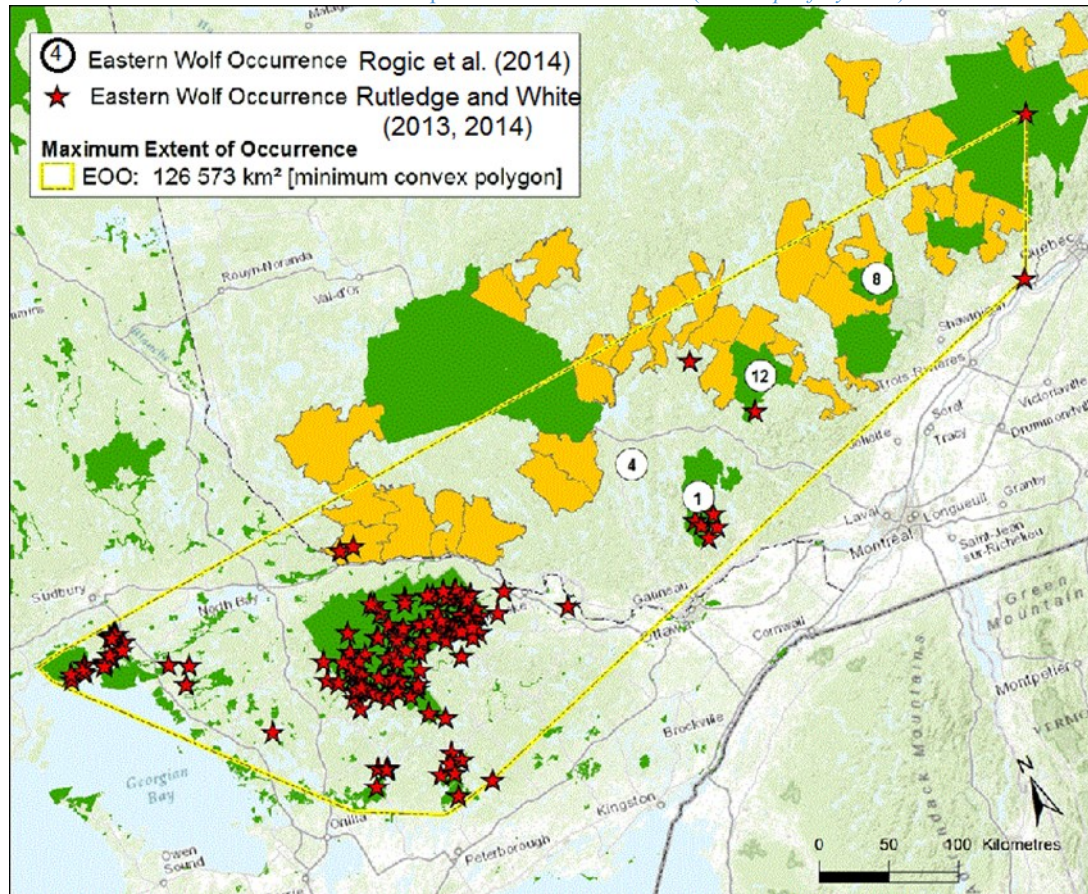
The WAAT program is a 10 week program created to develop social skills for at risk adolescents aged between 15 and 20 years old. Each session built on the previous one through various animal training exercises inspired by Stacy Grover (2010). The program included an introduction session without animals. The final session was an award celebration with mentions and rewards; consequently, participants actively work with animals for eight consecutive weeks. Sessions were modified on a need-to basis as participants’ or animal behaviour improved, stagnated, or regressed. Training exercises were developed and implemented with the help of CJE intervention team members, PSA staff, EMSB high school personnel, and Dogue Shop volunteers. Different sets of abilities were addressed each week: social closeness (attachment), confidence (self-esteem), communication, problem-solving, and emotional management (self-awareness). It was decided the first 4 sessions would be conducted with dogs to develop participant training skills and assess fear towards canines, if any. Participants were introduced to clicker training and fine-tuned their hand-eye coordination abilities with dogs and rats. The following sessions were conducted with wolves. The second to last session was documented by the French television network TV5 (2011).

Wolf Animal-Assisted Therapy Program Overview

Of the 7000 wolves in Quebec, 402 individuals were killed in 2002. The statistic represents approximately 6% of the entire provincial wolf population (Hénault & Jolicoeur, 2003). The form of the killings results from a disguised bounty established in the late 80s. Wolves are mostly killed for the fur industry; consequently, Canada’s grey wolf (*Canis lupus*) population is not at risk according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2015). The only wild canid with a protected status in Canada is Ontario’s Eastern wolf (*Canis sp. cf. lycaon*) which is classified as threatened. The Northern grey wolf (*Canis lupus occidentalis*) and the Southern grey wolf (*Canis lupus nubilus*) are not at risk; unfortunately, wolf status could change rapidly due to climate change and habitat loss.

Wolves, as animal-assisted therapy partners, offer unique opportunities to implement and maintain lifelong changes for both human and non-human species. In his book *Wild Justice: The Moral Lives of Animals*, Mark Bekoff writes “These neurons [mirror neurons] allow us to understand another individual’s behaviour by imagining ourselves into the other individual’s shoes.” (2009, p. 29). When people attach to wolves, the inter-species relationship creates a remarkable, indescribable, and often unforgettable bond forever imprinted in human consciousness; consequently, people who have experienced a wild or captive wolf encounter are more likely to get involved with conservation and habitat loss (Bekoff & Pierce, 2009).

Figure 1 - COSEWIC Assessment and Status Report on the Eastern Wolf (*Canis sp. cf. lycaon*) in Canada - 2015



Adolescents and wolves are very similar in their perceived behavioural expressions. Some human adults view wolves as wild unpredictable animals whose sole purpose is to destroy the environment. To a certain extent, adolescent behaviour is equally perceived by certain adults. Furthermore, teenagers believe most adults view them as destructive, wild, and unpredictable humans (Laser & Nicotera, 2011). Consequently, both teenagers themselves and adults have come to accept adolescents and wolves as marginalised creatures of society to be feared, conquered, or eradicated.

The WAAT program goals are to dispel misconceptions attributed to both adolescent and wolf behaviour and to transform marginalized associations into symbiotic relationships. Human objectives were designed to create secure attachments between wolves and teenagers through training exercises, cognitive games, and social imitation (Soobrayan Sentoo, 2003). Wolf objectives were intended to promote conservation and provide enrichment through planned interactions. Because the WAAT program was (is) so innovative, we found little documentation to help plan sessions ahead of time; consequently, some exercises were adjusted as they occurred. Safety remained our primary objective during the entire program. Sessions were video documented and participant files were completed after each day.

Method Overview

We used a pre-post five point bipolar scale evaluation questionnaire to assess teen knowledge and beliefs regarding wolf conservation and interpersonal skills. The pre-evaluation questionnaire was composed of five questions with possible answers ranging from “not at all” to “a lot” and from “very bad” to “very good”. The post-evaluation questionnaire was composed of nine questions with only six relating to interpersonal skills and wolf knowledge. The post-evaluation questionnaire offered possible answers varying from “not at all” to “a lot” and from “very bad” to “very good”. The three remaining questions were directly related to the program structure and development and offered valuable feedback for future WAAT sessions.

Sessions were video and photo documented. Interactions were analyzed to identify the presence of our goals and objectives. Each week, a table was filled to document each participant’s goals and ob-

jectives: attachment, communication, self-esteem, problem-solving skills, empathy, and conservation. The following table is a sample from week three documentation. The “x” simply marks if skills were observed during sessions or not. Each week tables were completed by the intervention team which later compiled and corroborated written data with video and photo documentation.

We did not evaluate skill levels each week because of unpredictable environmental variables like weather. Human and animal behaviour variables also affected weekly evaluations. We chose a cumulative approach and decided to compile achievement data at the end of the program. Figure 2 summarises the data we collected from the WAAT program. A decision was made to evaluate personal and group social skills acquisition as a measure of attribute instead of evaluating depth and breadth of skill experience. Lupine knowledge could not be adequately pre-evaluated as participants were highly unlikely to have spent unprotected contact with wolves.

Sample Group Description

None of the participants displayed fear towards rats, dogs or wolves. Sample size was comprised of eight participants: six boys and two girls. Participants were grouped into four categories based on their pre and post evaluation forms (Table 1). One girl was diagnosed with depression, one girl had low self-esteem, two boys were diagnosed with Asperger syndrome, and four boys were involved with social services for abandonment and neglect. One boy with Asperger lived in a group home. The participants came from different high schools within the EMSB and CJE. All participants had insecure attachments toward parental figures. Finally three of our participants had drug related problems. Drug and alcohol consumption was controlled through the honor system; however, intervention personnel closely knew participants and were confident they could identify participants who had consumed drugs or alcohol.

On their pre-program evaluation forms, only two people voiced their concern about wolf conservation on social media while most participants did not express concern over wolf conservation. Only two families signed released forms allowing participants Michael and Jessie to be filmed by the television crew TV5. The pilot project was documented on 21 July 2011. The day was memorable because the temperature was 35.6° Celsius in the shade. Regardless of the extreme weather, our teens and resident wolves were very cooperative.

Wolf Socialization and Training

Both Arctic wolves (*Canis lupus arctos*) in the WAAT program were hand reared and socialized towards people on a continuous schedule from birth to four months old. The 24 hour schedule included exposure to people, dogs, and other strange situations like television sets and golf tournaments. Socialization towards humans continued throughout daily walks and visits for a strict minimum of one hour per day. Wolves Ruby and Akiak were both exposed to visitors and various staff members. Ruby was three months old when the program started and Akiak was five years old. Even though both females were intact, neither wolf was part of the reproduction program. Both wolves were kept off exhibit during the day and kept in an enclosure at night time. The cool night air felt during Quebec’s summer heat was highly beneficial for Ruby. The nightly exposure also served as enrichment for both female wolves.

The wolves were trained with positive reinforcement for simple behaviours such as walk on leash, come when name is called, pose (stand still next to a person), and sit. The later behaviour was never put on cue. Daily rations of food were used as reinforcement and kept on trainers during sessions. The food was kept in plastic containers attached to trainers’ belts. Both clicker and mouth pops were used to bridge stimuli. WAAT did not necessitate highly trained animals because the program required participants to train selected behaviours presented to them during sessions. Participants were expected to problem solve through training exercises which in turn encouraged social skill development.

Program Successes and Shortcomings

WAAT served to establish a secure attachment between wolves, teenagers, and program leaders. The rate at which teenagers bonded with wolves could potentially be attributed to the program length itself. The limited number of sessions could have contributed to speedy attachment because participants relinquished preconceived beliefs and myths during the first few sessions. However, the participants might have been psychologically predisposed to succeed because of the limited number of weeks available in direct contact. One possible explanation might be teenagers unconsciously feared failure and possible removal from program, thus, were on their best behaviour.

Overall, the program was a success with an increase in social skill sets and conservation. Figure 2 summarizes data collected from the WAAT program pre and post evaluation forms. Participants reported an increase in wild wolf conservation efforts; conversely, the concept of training as enrichment remained abstract. Enrichment and problem solving skills did not increase as expected. Enrichment objects were presented to the animals as games and puzzles which participants had previously made. Only a few teens seemed to have grasped the concept of enrichment. Adolescents understood enrichment in terms of games made and played but not as a wellness outlet. One possible explanation might be because training sessions were tangible activities with direct visible results as opposed to enrichment which only offered indiscernible results. Future program sessions could include human enrichment games such as riddle egg hunts (Grover, 2010) or human superhero chess (Marvel, 2017).

Both individual and group skill averages increased by approximately 50%. Session design exercises are closely correlated with social skill goals. On week three, training exercises purposefully included a high failure probability in order to reach intended confidence enhancement objective; however, the session concluded with positive outcomes for all participants. The objective for week five was to develop empathy. In the fifth session design, participants were asked to draw a human-wolf animal and describe how the picture related to their present life story. Members were encouraged to stay within their human-animal teams throughout the process. Follow-up questions focused on individual perception and description of captive versus wild wolf emotions. Sample questions included “*How do you think wild wolves feel about other wild wolves?*” and “*If you were your wolf, how would you feel about living in captivity?*” Figure 2 summarises individual evaluation forms. In blue, social skill set averages were assessed pre and post WAAT program. Group averages, in red, were compiled pre and post program to give our team an overall understanding of group development. To our surprise, individual and group averages increased in conjunction.

Another shortcoming was the actual conclusion of the program. We did not plan a special end, other than thanking participants for their involvement in the program. Group consultation feared participants might experience attachment loss, or abandonment; consequently, we designed an award ceremony. In the regular dog animal-assisted therapy (DAAT) program, we conduct a farewell presentation to the rest of the school. Each human-animal team introduces their pet-partner and demonstrate the behaviours they have accomplished. We organized the same type of conclusion for our pilot program. Participants receive an extra self-esteem and confidence boost which ended our programs on a positive note rather than on a negative outcome. Future WAAT programs will undoubtedly finish in a similar fashion.

Conclusion

Animal-assisted therapy programs, in general, tend to reduce the number of sessions required when compared to traditional non-animal related therapy (Dimitrijević, 2009). The WAAT program effectively reduced the number of therapy sessions even further because the attachment to the wolf as an animal-partner broke through emotional barriers much more rapidly. Chandler (2001) best described animal attachment and session expectations when she wrote “Animals actually help a person to focus on a task because of an interest in interacting with the pet.” (p. 1).

Other exotic animals like zebras (*Equus grevyi*), Wapiti (*Cervus canadensis*), or foxes (*Vulpes vulpes*) could be considered as effective therapy partners. Giant animal species should not be proscribed; we believe participants could benefit from protected contact exposure and still reach intended goals. Side benefits to exotic AAT programs heighten conservation efforts, enrichment, and environmental preservation.

WAAT achieved, beyond our expectations, the goals and objectives we set out to reach. Participants securely attached to animals, emotionally bonded with adults, improved social skill sets, and developed conservation strategies. Animal-assisted therapy, as an emerging field, offers new and innovative ways to think and approach old problems. Wolf animal-assisted therapy is a *think outside the box* intervention method capable of extracting hidden human emotions and healing psychological disturbances. Permanent implementation of wolf animal-assisted therapy programs in zoological settings is inevitable, for both humans and animals benefit from the symbiotic attachment, read relationship.

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On The Rebound: Rebuilding A Trust Account With A Brush-Tail Rock Wallaby

Jade Fountain
Tidbinbilla Nature Reserve

Ambassador animals can be an important face of a species, particularly for animals that are shy, elusive and rarely seen in the wild, but also allow delivery of key conservation messages to visitors, students and the media. Australia has the highest mammal extinction rate in the world with 30 native mammals having become extinct over the past 400 years, or 1 out of 3 mammals, due to introduced predators such as feral foxes and cats, and land clearing. The Southern brush-tail rock wallaby is one of those endangered species, with only 40-80 estimated left of the southern sub-species in the wild. Tidbinbilla Nature Reserve in Canberra, Australia has been an integral centre for breeding and releasing brush-tail rock wallabies over the past 20 years.

From a place of curiosity, I've always wanted to know why some species are considered untrainable. What is it about some species that creates doubt that they can be trained? A label of impossibility, such as biases that kangaroos or other marsupials can't be trained.

Shadow, a Southern brush-tailed rock wallaby (*Petrogale penicillata*), was thrown out of his mum's pouch at four months of age and was hand raised by wildlife officers. Our goal was for him to meet people during animal encounters, with an aim to provide a unique and educational opportunity to see rock wallabies up close. The team encountered challenges when Shadow started biting staff and showing anxiety-related aggression. He would rush and grab legs at knee level with his front paws and follow this with a bite. Of note, at six months of age Shadow was required to be caught up for treatment of an injury to his left paw, with injections every second day. He was difficult to catch and the procedure was stressful for him and the staff. Shadow would vocalize loudly and hiss every time this happened, and he became wary of two people near him at once after that. When I met him, Shadow had many labels: bitey, aggressive, typical male marsupial, teenager, but none of these descriptions were helpful in creating a change in his behaviour.

After conducting functional assessments to ascertain the function of his aggressive responses, we created an operant training plan focused on positive reinforcement, reinforcement of incompatible behaviours, and setting up his environment to promote desirable behaviours. The training program included plans to teach voluntary injections where he could participate in his own vet care, stationing on a bale of hay or his crate, which meant he couldn't be near legs, and building cooperative relationships that would ultimately improve our ability to care for him. Firstly, we aimed for prevention and management of the environment: where possible, prevent opportunity for Shadow to practice unwanted behaviour such as avoiding cornering or reaching over him, stopping any patting and cuddling from staff, and not allowing him to continue jumping onto staff shoulders. Knowing when to disengage and identify times to end the

session and stop interacting with Shadow when he was aroused or agitated or not interested in a session were important considerations. He was hand fed to build relationships back up, and started target training so he could be asked to move from a to b and step onto scales to weigh himself. We created an entry procedure by teaching him to move to his crate and only open the door and enter when he waited on the station. He was taught a head turn which was incompatible with leaning into personal space, reaching or grabbing at people. Finally, he was taught to accept tactile and handling, which we built up to him accepting injections. He would voluntarily sit still for an injection after two months. We also desensitised him to lots of strange people to facilitate future guest interactions. Getting guests to meet an endangered species to build compassion and understanding of the species plight, the role Tidbinbilla plays in the survival of the species, and attracting guests to want to participate in the visitor experience was important. Consent in ambassador animals is often overlooked; using touching request tests can give clues as to how we should manage animals in many cases. We took the touching out of our meet and greets because they were not right for Shadow. We adapted people to sit by him for a photo, instead of being in his space and allowed him to leave the area at any time he chose to.

As a result of the team's dedication to the plan, Shadow has been a huge success for the endangered species program at Tidbinbilla and the face of the brush-tail rock wallaby recovery program. He has contributed to knowledge of the species and has inspired stake-holders and important ministers who make key environmental protection decisions.

Key learning points in what Shadow taught us:

The animal's world view should shape our response. Ask questions of the animal in front of you. People struggle to perceive something outside of our own experiences. From the staff perspective, the daily injections for an injured paw weren't that bad, and besides, Shadow is used to be handled, right? Not understanding to plan for past history could have held us up – a brain functioning under past trauma of any kind needs to learn new expectations and rebuild relationships.

No matter what species we are working with, what label has been put on them, we need to understand their own personal experiences from the animals perspective, value trust, particularly in a culture with changing staff. Time was taken to build a new person in each time, before they moved into any invasive handling.

Expect a level of resurgence and spontaneous recovery of behaviour. Progress didn't occur over night, we saw many troughs and peaks of success, and days that criteria wasn't reached. Taking records and looking at data provided key information to what worked and enabled us to look back and track progress.

Funding Shadow leveraged for the organisation and representing his species – meeting the Minister for Environment and the Threatened Species Commissioner were important milestones in his meet and greets. Part of securing crucial funding for a half-a million dollar project for an exciting 120ha open range breeding site at Tidbinbilla and saw the brush-tail rock wallaby become the ACT mammal emblem.

It takes time to build a trust centred relationship, build understanding of expectations and get to know your animal, the short comings and to be familiar with a species. Most importantly, to know the individual in front of you. If we can change the world for that animal, we can change the world for a whole species.

From Glove to Exhibit: One Hawk's Flight to the Top

Victoria Karabanova, Leslie Storer, Kameron Thiele

Conservation Society of California, Oakland Zoo

*In July 2015 the Oakland Zoo acquired a red-tailed hawk (*Buteo jamaicensis*) "Ojai" from a raptor rehabilitation facility with the intention of training her to be an ambassador animal for our Education Department. The training plan focused on desensitization and using positive reinforcement, as with counter-conditioning. Ojai's training presented us with challenges, causing us to modify our training plan numerous times, including phasing out the glove. We decided Ojai would not be a suitable ambassador animal for our Education Department. She would instead move to the "California Trail" section of the Oakland Zoo, a new area that features species currently or once found in California. The team prioritized crate training and training her to respond to a lure on the ground, so keepers would be able to recall her in the large habitat she would share with two California condors (*Gymnogyps californianus*). We created a training plan for introducing her to the new habitat, the milestones of which she reached faster than expected. We currently maintain scale, lure, and recall behaviors and have introduced new staff. Training in the same space as condors has presented challenges. We have also created new goals: medical behaviors, demonstrations for guests and behind-the-scenes experiences near strangers.*

Red-tailed hawks (*Buteo jamaicensis*) are a widespread raptor species found across North America and into Central America. They are highly adaptable and will commonly sit on tall perches near roadways looking for a wide variety small mammals, birds and reptiles. Due to their adaptability and the species' abundance, red-tailed hawks are commonly trained for use in education programs.

The Oakland Zoo's Animal Care, Conservation, and Research Department (ACCR) acquired "Ojai" from the Ojai Raptor Center, because our Education Department wanted a large raptor for education programs. The plan was for a team of ACCR keepers to train Ojai to sit comfortably on a glove for education programs both on and off grounds, then, once established, train Education Department staff to handle her for their programs.

We wanted to train Ojai while allowing her to remain "free-lofted", or free to fly loose around her enclosure. We did not associate ourselves with netting or other medical procedures. Ojai's initial training started in a large outdoor stall at the Oakland Zoo Veterinary Hospital (OZVH). When training, we entered the stall but remained in the front corner of the stall closest to one of two perches, allowing her most of the space to retreat from us. She was later moved closer to the Education Department, where other program animals are housed. Her new enclosure was made of chainlink fabric with a netted ceiling and measured 15m long, 0.2m wide, and 3m high. There were two 0.2m perches, each of which spanned the width of the enclosure, which were distributed along the length of the enclosure. There were stumps and low perches set on the ground. We continued to remain in one confined portion of the enclosure during training sessions. We would service the enclosure during separate, non-training sessions, moving slowly throughout the entire enclosure, allowing her time and space to avoid the keeper.

During an intake exam, she was fitted with anklets but no jesses. We wanted to avoid falling back on holding jesses while training indoors. Once she reached the point of trusting us enough to step up onto a glove and go outdoors, holding jesses would be mandatory. We hoped that by that point, we would have deposited enough in our "trust" account, that if she were to bait, the feeling of restraint would be

overcome with minimal stress.

We avoided strict weight management and chose to manage her diet based on her behavior, knowing that progress would be slow. Her daily food consumption averaged 70g. Ojai would readily stand on a platform attached to an analog scale mounted to the side of her enclosure. We could stand inside several feet away or outside the enclosure and read her weight. Her weight averaged 1,220g.

We focused on three basic behaviors in order to prepare her for life as a program animal. We recalled her to any perch within our third of the enclosure. This was initiated by baiting a perch with a small food reinforcer. She was called to the scale platform in this manner. We started to train her to step on a glove, also initially by baiting.

At this point, the team experienced varied success. Foundational relationships formed, we established the bridging stimulus and we were able to monitor her weight. The combination of an unmanned bird and a team of trainers with various levels of experience manning raptors created challenges, which we attempted to overcome with the help of consultants. Early in the process, the team discussed training plans with highly experienced bird trainers, Cathy Schlott and Christa Gaus, from the National Aviary. Unfortunately, remote consultation from industry experts, even with the aid of video, has its limitations. We also consulted Margaret Whitaker at numerous stages of Ojai's training. The initial team also proved to be too small and limited, so additional ACCR keepers who also had experience training raptors joined the team.

Ojai may have been unmanned, but she was not naive. She incurred a left-wing injury in the wild, hence her rehabilitation. Due to her earlier extended negative exposure to humans, the presence of keepers was highly aversive at first. Offering food as a reinforcer was challenging, because keepers had to be present to offer food reinforcer. We included a negative reinforcer in our training program: removal of a trainer, the aversive stimulus.

On May 1, 2017 a new keeper became Ojai's lead keeper. The new lead assessed the team's efforts up to that point and we decided to modify the plan and have contingency plans in place, if Ojai's progress towards becoming a program animal continued to stall. Glove training and recalling to specific perches would continue. We emphasized changing baiting with reinforcement to cuing then reinforcing. The team also started to consider transferring Ojai to a new part of the zoo that was under construction: California Trail.

California Trail exhibits feature species that currently or historically resided in California. There would be two large aviaries: one with bald eagles (*Haliaeetus leucocephalus*) and one with California condors (*Gymnogyps californianus*). After several months of effort and only incremental progress, we decided it would be in Ojai's best interest for her to take up residence in the future California condor habitat. The plan was modified to focus on crate training.

The criteria for her certain behaviors were also modified. For her recall, the criterion was that she landed anywhere along the specified 3m perch, as opposed to a specific place on the specified perch close to the keeper. After this change, there was a noticeable improvement in her confidence resulting in faster response times and overall progress towards our training goals.

As the move date approached, the team focused on crate training. Her crate is 74cm long, 38cm high, and 32cm wide made of painted plywood with two guillotine doors, one at each end, a mat in the bottom and a perch across the width of the crate 5cm off the ground. We made two holes in the side of the crate through which we offered reinforcers: one at the perch, to reinforce her for approximations into the crate, and one past the perch, to reinforce her for standing on the perch in the crate. The front guillotine door was rigged with a rope fed through a ceiling-mounted pulley to allow us to raise and lower the door. The crate was placed on a longer table, creating a 20cm platform in front of the crate on which she could land.

We introduced the crate without the back and front guillotine doors. On days when we were not doing a formal training session, we left food in the crate for her to retrieve on her own. During training sessions, we reinforced her when she landed on the table in front of the crate. At this point her confidence had increased, and she adapted to the crate quite quickly. After we introduced the back guillotine door, several weeks passed before she would stay in the crate without flying out immediately with a small chunk of food in her foot or beak. Once she reliably stayed in the box calmly, the front guillotine door was introduced, secured, motionless in the open position above the opening. We again asked Ojai increasingly closer to the front of and eventually into the crate.

In May 2018 two keepers from the newly formed California Trail keeping team joined Ojai's team. We also decided to work from outside of the exhibit (protected contact). A keeper would cue a specific perch through the chainlink fence, deliver reinforcement on the specified perch, then cue to another perch, and so on.

We introduced front guillotine door movement by reinforcing her when she was on a perch approximately ten feet away and moving the door slightly up and down. While her comfort sitting in her crate for reinforcement gradually increased, she never completely relaxed in the crate. Seeing the guillotine door move from several feet away did not appear to help her comfort level when near the crate. We were concerned she would not be fully crate trained by the time we had to move her. During the weeks leading up to moving day, we decided to focus on increasing her comfort level inside the crate instead of door movement. We determined that the door movement had been the cause of such a regression, we chose to gamble that we would be able to trap her in the crate on moving day.

With her pending move to a 1,672 square meter (18,000 square foot) habitat, we wanted an additional way of getting Ojai's attention in case she was not recalling well. We started training her to come to the ground and foot a lure. The lure was to be our tool for asking Ojai to come close to us in this large new aviary, primarily to do a daily visual health check. By associating a lure with an extra-large reinforcer, we thought we would have an additional way of confirming health and appetite after she was moved.

On moving day Ojai was asked into the crate and went right in but grabbed her reinforcement and jumped back out of the crate, right into a half-closed door. The door was immediately reopened. Ojai finished her reinforcement and she was asked back into the crate. She hopped right back in and we closed the door completely. She had been successfully trapped and was ready to move to California Trail.

Ojai spent two weeks in the 4.3m wide, 4.3m long, 9m high holding stalls of the California condor exhibit. We established a set of milestones for her to reach before we felt comfortable releasing her into the aviary: 1) eat while confined in the holding stall, 2) eat with a keeper present in the service area outside the holding stall, and 3) fly to a perch when cued and eat from a keeper in the service area, protected contact. She reached these first milestones within the first hour. The fourth milestone was to stand on the same wall-mounted scale consistently. The fifth, and final, milestone was that she responded to the lure while in the holding stall. We started the lure training before the move but had only made moderate progress. After one and a half weeks in the holding stall, she was consistently contacting the lure.

After Ojai had access to the whole aviary, we focused on her scale behavior so we could monitor her weight in the new space. We knew that, when confined in the holding stall, she would stand on the scale and were hopeful that she would do the same after she had more space. During the first session, she flew into the holding stall following a cue, hopped from perch to perch and finally hopped to the scale. There was much rejoicing. Her weight currently averages 1280g, an increase from her previous average of 1220g.

The condors' presence affected Ojai's management in a way we were not expecting. Our initial plan was to train Ojai daily and fast her one day per week and feed condors three days per week and fast them four days. When the condors were fed, food was left out so they could gorge themselves. We observed Ojai taking portions of the condors' food and realized we needed to ensure she was satiated before the condors were offered food. We also cleaned up leftover food after the condors had an opportunity to gorge themselves. On the three condor training days, we trained the two species in a specific order: red-tailed hawk then California condors. This helped but Ojai continued to keep a watchful eye on the condor food during our condor training sessions. We began to feed Ojai a larger portion on the condor feed days, so she would be too satiated to steal from the condors. We continue to modify both species' diets as husbandry priorities and the consequent training foci change.

Ojai quickly learned novel behaviors in her new circumstances. She shifts inside the holding stall for various amounts of time. We continue to refine old behaviors. She comes reliably to a perch close to a guest viewing area for potential keeper talks. We plan to train her to enter a crate voluntarily and allow the door to close, as opposed to trapping her. We can train new behaviors. We would like her to accept tactile stimulus for medical purposes such as applying topical medication, injections, or checking feather condition. We would like to desensitize her to a stranger's presence for behind-the-scenes guest experiences. We have not ruled out glove training.

We could never have predicted the successes and failures we experienced. The team is made up of keepers with varied backgrounds, and everyone's different experiences and flexibility have been instrumental in our progress. We relied heavily on "out of the box" approaches. We ended up training a raptor how one would more likely train a psittacine in a free flight aviary instead of using more traditional falconry methods. As much as possible, we let her behavior dictate the direction of her training. She can choose to participate in training sessions or sit at the top of a mature oak tree overlooking a panoramic view of the San Francisco Bay Area. We consider ourselves very lucky to be able to work with a red-tailed hawk in this capacity and at our facility.

Making the Most of What You Have: Behavior and Welfare in an Evolving Context

Jake Belair, CPBT-KA

Ambassador Animal Keeper II, Nashville Zoo at Grassmere

*The Nashville Zoo's Ambassador Animal program is in its 24th year, and with that comes the celebration of some major accomplishments, as well as an acknowledgement of the ways in which we can improve. I want to share the stories of our work with three individuals—a silvery-cheeked hornbill (*Bycanistes brevis*), a kookaburra (*Dacelo novaeguineae*), and a Harris' hawk (*Parabuteo unicinctus*), in order to help describe our consistent emphasis on choice, control, and enhanced welfare for our ambassador animals. We radically changed the way our hornbill is handled, and now she can operate fully upon her environment. Our kookaburra, on the other hand, came to us recently as a chick and we were able to train her exclusively with positive reinforcement methods. We still have to use anklets and jesses on our Harris' hawk, but we have changed his flight routine so that he has complete control over where he goes and when the session is over. These examples demonstrate that even with limited resources, we can still promote voluntary participation with the vast majority of animals in our collections. I also want to make the case that any progressive change should be celebrated. These changes do not have to happen all at once—in fact, that is rarely possible. Instead, we focus on tangible, manageable changes; ones that do not require significantly reducing the number of animals available for programming, but instead encourage us to be flexible with our ideas of what the animals' jobs are meant to be.*

Similar to most institutions, the Nashville Zoo makes regular welfare assessments on its entire collection. Of particular importance is the welfare of the 50 or so species of ambassador animals. These animals regularly travel offsite to outreach programs, work onsite in daily shows and encounters, and have a large number of staff involved in their care, handling, and training. As a team, we have been pushing to provide the ambassador animals with as much choice and control as possible, while remaining realistic about our obligations and needs as an institution. Our team is committed to providing the highest quality care possible from birth to death for each animal. This means that we rarely rehome ambassadors, unless there is another institution that is more ideally suited to the animal's individual needs. Instead, we do our best to adapt the tasks that we ask of the animals to what they are best suited doing.

The collection is large and small at the same time--about 80 individuals, not counting every single arthropod, but each ambassador has numerous responsibilities. Docents, educators, outreach staff, and show staff all need animals for programming, in addition to daily encounters and frequent media appearances. Thus, 80 seems like a lot, but when rest days, off days for animals under vet treatment, etc. are all factored in, that number quickly dwindles. Other limiting factors on the ambassador animal team are the mandatory 30 day quarantine that limits the amount of training that can be done when new animals are acquired, animals that arrive ahead of our collection plan schedule (which quickly pulls resources and space), a 7 month show season that begins when temperatures can still be below 40 degrees Fahrenheit, and less than ideal show facilities (having to crate animals and transport crates to show location, etc.). All of this is shared, not with the intention of garnering sympathy but to help explain our reality, and thus our philosophy.

Jane, our silvery-cheeked hornbill, had been handled the same way for many years. She was hand-reared, and thus, very interested in socializing with humans, but she did not have much choice or control in her life. Early in her time at the zoo, she was toe-held and handled in a way that did not allow her to

move from the hand unless going into the crate or her enclosure. Her trainers 15 years ago interacted with her on a daily basis, through socializing and grooming sessions, which enhanced their relationships with her. About 3 years ago, we had the opportunity to begin trying to train Jane to step up voluntarily. Until that point, she had been bounced between different trainers but with limited success. Jane was trained to be comfortable letting guests touch her, giving them a unique experience, and she appeared to have a positive association with that experience as long as she was with a trainer, she had a bond with. She was not very motivated for food or novel objects, but she did like grapes.

Through careful arrangement of antecedents and consequences, we were able to teach Jane to hop onto our hands sideways from a perch--at this point, hopping completely off the perch and onto a hand was not going to be an option unless we created more motivation by pulling food, given that we had tried every other manner of social, tactile, novel object, food, sun, et cetera, to no avail. After she had been doing that behavior for a while, we pushed for her to be worked without holding her toes. Our management team was supportive, but this move came with a tradeoff--it severely limited where we were able to utilize Jane for programming. Whereas she used to work for programs around the zoo a dozen times a month in addition to daily shows, Jane now performs twice daily in shows, but nowhere else around the park. This puts extra strain on other animals and limits the number of programs we can agree to do. It is certainly worth the cost to offer Jane enhanced welfare, but it is important to be honest about the effect of working her while giving her full choice and control. Part of making the most of what we have is determining where individuals are most comfortable and then rebalancing the work loads of the other animals in the collection.

The next step was to train Jane to be comfortable on stage without restraint, and teach her to do short flights and hops, as well. That turned out to be the easy part--using what we knew about how Jane moved and when she chose to fly, we were able to get her doing short (12 foot or less) flights onstage within a couple weeks. Typically, our process for free-flying birds is much more extensive, but we relied on a couple factors when making the decision to jump straight to working on stage with Jane. One factor was that our amphitheater is recessed about twenty feet, which offers a barrier in case a bird might make a wrong turn. The other factor was that Jane has been working in the amphitheater for most of her 17-year history, and her body language and other behavior tells us that she is quite comfortable there.

In three years, we have gone from a bird who was toe-held and needed to be physically picked up to get on the hand to a bird who can operate completely upon her environment. Jane comes out onto the stage from a small hole in the wall, flies around, and then hops backstage, onto a hand, and gets asked to crate. It is a simple behavior, but the change in her demeanor and the novelty for our audience have been dynamic. Certainly, if we had the opportunity to pull Jane out of programming and focus solely on this training, we may have accomplished all of our goals at a more rapid pace. However, that was not a possibility for us at the time--what is ideal is very rarely reality. Balancing resources is necessary, meaning that hard decisions must be made.

When we acquired our 6-month-old kookaburra, it was clear from the start that we needed to work hard to expose her to various stimuli. Thirty-day quarantine in a very quiet animal clinic with extremely limited foot traffic did not help the matter. When Adelaide was cleared and came down to our Ambassador Animal Building (AAB), she was reactive to everything from her neighbors to staff walking by to new enrichment objects and even her water bowl. Staff noticed that she was uneasy almost constantly, freezing at new sights or sounds, and occasionally attempting to avoid things and hitting the mesh of her enclosure.

Since we were able to start training this animal the way we wanted to, we gave her as much choice and control as possible and decided to let her behavior tell us what job would be best for her. With that in mind, we knew that she would need to learn how to crate, weigh, and come to the hand, if possible. It soon became apparent that keeping her in the AAB was detrimental to the training process. We would make a week's worth of progress, then something would spook her (a civet climbing, a cockatoo screaming, or a staff member answering a radio call) and we would be set back two weeks. She required the utmost consistency--any minute change or hesitation on the trainer's part would mean she would fly right back to her enclosure.

When a spot opened up in our bird of prey mews, we leaped at the opportunity to try moving Adelaide outside. At this point, six months in with her training, she would weigh reliably 90% of the time and crate

reliably 60% of the time, but only for one or two trainers. Once Adelaide was established in her outdoor enclosure, her hopping to the hand and weighing behaviors were able to be passed off to all the rest of our ambassador animal team and most of our outreach team. Her confidence soared--she was still neophobic, but far less than she had been in the AAB. Since her move, Adelaide has come leaps and bounds. She is trained to fly to guests' hands during shows, as well as steal mealworms from a trainer's fingers, showing off kingfisher agility.

It's also important to share setbacks--Adelaide recently had a sarcocystis scare, meaning that she had to be caught up multiple times over the course of two weeks. Of course, this could have been helped if our team had the time to train a voluntary towel behavior, but that is not possible for us at this point. Thus, Adelaide is in the process of rebuilding her trust in her trainers, but I am happy to report that she is very much on the mend. The frequent grab-ups certainly withdrew quite a bit from the trust account, but we have been able to quickly make our way back into her good faith. Looking forward, we would love to train voluntary restraint and other husbandry behaviors with our entire collection. The priorities set by our leadership are to work on behaviors geared toward shows, and we have an obligation to reach guests with messages of conservation, which means that we sometimes have to put certain goals in front of others. That means that, at times, show and encounter behaviors must be trained before husbandry behaviors.

Our thirteen-year-old Harris' hawk, Diego, has been utilized on the glove and in free flight programs, but we recently trained him to fly straight back to his mews from the amphitheater. He crates voluntarily, is released for his flight routine, and then is recalled. Previously, Diego's routine had been flights from one perch to the next, then to a trainer's glove onstage. Over the years, his consistency diminished, and it was possible that a stagnant routine and ending on a glove had an effect that was not positive.

While brainstorming ideas for new flight paths and routines, we settled on training Diego to recall, and to work him without asking him to come to the glove. It took a bit of time to get this behavior solid, but he now is released, catches a piece of food that is tossed into the air, and then lands in a tree. After that, Diego is recalled back to his mews. With a 90% rate of behavior completion and such a dynamic behavior to share with our audiences, we are thrilled with this change. Many factors affect the 10% of repetitions that do not go as planned, but the most common are native bird nests built around our amphitheater structure and trainer error (improperly timed recall or incorrect placement of food in midair).

Diego is trained to step up and allow jesses to be put in from glove work, but it is evident that he would prefer not to be held on the glove. Unfortunately, with the amount of programming that we are required to do, we are not able to take Diego completely off use on the glove and utilize him only for free flight, but we are doing our best to make the experience as positive as possible. He most often chooses to participate when he is going to fly, and he more frequently chooses to not participate when he is going to be held on the glove. As with many animals, it takes a lot of time to build trust and foster a positive relationship with Diego.

Time is a precious resource in most ambassador animal settings--if time is spent working with one animal, that is time that is not spent cleaning, training, or enriching any number of other individuals. We strive to be as efficient as possible with our time, in addition to splitting our resources to focus on priority training. With this mindset, we have been able to slowly (sometimes very slowly) push for more choice and control for our collection. We make concessions for things like injections or blood draws, which happen infrequently enough that they can be net neutral with some work.

Frequently we hear of the success's trainers are having while offering their animals choice and control. We less frequently hear of the process, the setbacks, or the cost of moving to such methods. Most of us in the ambassador animal community would love the resources to acquire animals at the perfect age for the species, to move them directly into their permanent home and have the trainers who will be working them as adults begin the process right away, and to build different facilities or props when things do not work out as planned. However, most of us do not have that ability, but what we do have is the opportunity to make small steps in the right direction that afford our animals the best possible welfare without compromising obligations and directives. Choosing to give one animal more choice and control is better than not offering it to any animals. There is always work to be done, but when you break large goals down to more tangible changes and employ a flexible timeline, your team and your animals will all benefit.

How Our Zebra Earned Their Stripes

Jenyva Fox

Senior Lead Animal Keeper

Cheyenne Mountain Zoo, Colorado Springs, CO

Cheyenne Mountain Zoo's (CMZ) staff is passionate about taking animal training to higher levels to improve the lives of the animals in our care. This includes forward thinking when it comes to training basic husbandry or veterinary care behaviors. Furthermore, our zoo's goal of creating defining moments for our guests inspires us as trainers to create opportunities that connect people with our incredible animals.

The power of positive reinforcement training with our 2.0 Grant's zebra became evident several years ago when we actively decided to move away from using negative reinforcement to shift them on and off exhibit. We started by teaching them to come toward us for positive reinforcers. This strategy led to a more trusting relationship with our zebra, and we have been able to continually build many cooperative behaviors (body inspections, injections, blood draws, hoof care, voluntary radiographs, etc.) with them since that time.

Additionally, relationship building with our zebra has led to exciting opportunities for us to provide our zoo guests and donors with unique and memorable up-close encounters with our zebra. How many people can say that they have scratched a zebra, been licked by a zebra or taken a selfie with a smiling zebra? These experiences connect our guests to our animals and inspire them to conserve wildlife, which is our ultimate goal. This paper will outline the behaviors we trained, how we give them choice and control during all training, including during interactions with guests, and how we got to where we are in creating a better future for wildlife through excellence in behavior management.

BACKGROUND

For many years we used spray bottles, rakes and loud voices to herd our two male Grant's zebra on or off exhibit. As is often the case when using negative reinforcement with our animals, we saw increased aggression, a lack of trust, decreased activity, apathy and even fear from our zebra. We knew that things needed to change and that we needed to find a different way to shift them.

Since both zebras were target trained, we started by using a broom handle with a tennis ball on the end as a very long target pole for increased safety. We worked with them free contact and focused on building a more positive relationship through target and station training as we shifted them through the giraffe yard. This relationship building took several years as we had been using negative reinforcement for over 3 years and had some catching up to do.

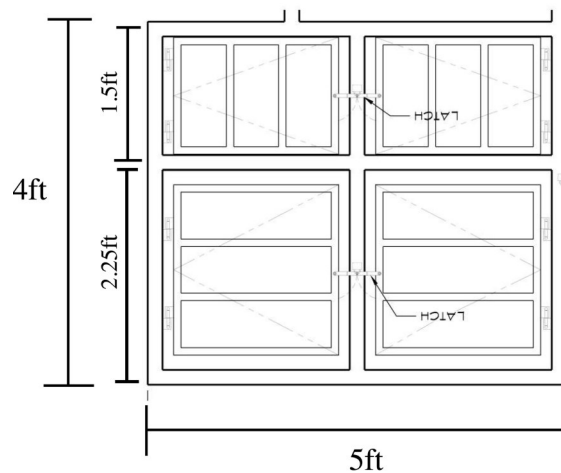
TRAINING PANEL

To further build our trust account with the zebra, we began working with them on exhibit, training them to come to the fence and line up alongside the mesh for us to perform basic physical exams. This basic behavior also allowed us to begin injection training. Up until this time, the zebra had to be darted for their vaccinations each year. Injection training took some time to develop as their fear and dislike of needles was so strong. It took us a few attempts trying to find a location that wasn't too sensitive for them. After a couple of years, we were able to give them their first-hand injected vaccinations!

We knew that in order to train any more veterinary behaviors we needed a training panel created. Since CMZ's goal is to perform 80% of our training on exhibit for guests to watch and learn from, we de-

cided to build this panel on exhibit. We modeled it after our moose training panel with multiple doors that could be opened to access various sections of the zebra's body.

Zebra Training Panel



DEFINING MOMENTS

The training panel afforded us the opportunity for guests to meet our zebra up close, connect with them and have a chance to touch them. The top windows could be opened to provide access to the zebra's shoulders and back. Mugambi, was chosen to provide these defining moment experiences to guests since he was less nervous around new people. During these encounters, he is targeted to the open panel window and holds on his target while guests take turns touching and scratching him. They can give him treats through the mesh and get their photo taken with him. They can even take a selfie with a smiling zebra! Meanwhile, over the years Wembe has become much braver around new people and thrills guests by giving them big, wet, sloppy licks on their hands as they are pressed against the mesh! CMZ offers zebra encounters to guests, donors and birthday groups and our zebra have personally met hundreds of people over the years and are excellent ambassadors for their species!

TRAINING FOR VOLUNTARY BLOOD DRAW

As our boys continued to age over the years, we decided to proactively train for blood draw in order to monitor overall health. Since our vet staff would be doing the actual blood draw, we decided to involve them in the training process right away. With staffing schedules sometimes not lining up perfectly, and Mugambi needing time to develop trust in the vet staff with whom he likely associated the dart gun, the process took longer than anticipated.

We started training at the training panel but found that we couldn't access the jugular vein effectively, so we cut an opening in the fencing to create our blood draw port. We desensitized him to pressure, holding off the vein, sharper sensations on the vessel, different types of tubing, dangling tubing, switching hands, etc. Once we felt that we could not approximate any more steps, we decided to go for the stick! Mugambi did very well on that first blood draw. His behavior did change in response to the stick, he stopped chewing, and lowered his head as the blood was being drawn, but he remained on target for the whole process. Since that first successful blood draw in October 2017, we have performed 2 more successful blood draws, each time being a smoother process.

TRAINING FOR HOOF CARE

At this point the next obvious veterinary behavior that needed to be trained was hoof care. We had just

completed stethoscope training so that our veterinarian could listen to heart, lung and belly sounds on either side of Mugambi's body. He needed to be very tolerant of touch in order to allow this, so now with more history of positive reinforcement training, I felt that he was now ready to move on to hoof care.

I tried multiple ways to get Mugambi to present his front left foot without being so weight-bearing on it. We tried varying heights of blocks, even trying black rubber tubs to see if that might work. Finally, I realized that everything that we were trying was too low for him and I tried switching to a cinder block. Since he wasn't offering his hoof on the block, I needed to help guide his foot. I worked on desensitizing him to touch high on his leg and running my hands down slowly, stopping at any point that he was showing nervousness (skin twitching, stomping, tail swishing). Two trainers were needed for this behavior, therefore clear communication was important for safety and consistency. A simple verbal warning "head" was given by the trainer at his head to let me know to pull my hands back if he started to lower his head towards me as sometimes, I couldn't see what his head was doing when focused on his feet.

Once he was comfortable with being touched along his leg, I started picking up the hoof using light upward and forward pressure to his pastern/ fetlock and bridging when I felt him relax into it. I had to guide his foot to the block the first several times until he started to understand what I was asking of him. I eventually phased out the pressure to just a light touch and the word "foot". Then I phased out the touch and just used the verbal cue "foot" to ask him to voluntarily place his foot on the block.

To shape a hoof curl, I found that if I ran both hands along his leg starting at the top that he would relax his foot enough to let it curl on his own. I introduced a verbal cue "curl" but never felt that he understood that cue and stopped using it. Now I just use one hand to run along the back of his leg below the knee (along the cannon) and he curls his foot. I then worked on duration of the curl long enough to start using a pick and brush on the bottom of the hoof.

Picking started by touching the bottom of his hoof with my fingers and tapping to create a different sensation. After one session I introduced a hoof pick and file and started picking and filing to see what his reaction would be. He has not had any negative reactions. Introducing the hoof knife will be the next step, preferably under the direction of our farrier during his next visit.

I've considered modifying our block by adding padding for Mugambi to rest his foot for longer hoof work sessions. Right now, I support his hoof with my hand during the sessions which could become fatiguing.

TRAINING FOR VOLUNTARY HOOF RADIOGRAPHS

In order to have a complete picture of the hoof health of our zebra, we needed to train them to allow us to take radiographs of their feet. The biggest challenge was coming up with a good design for a plate holder and a platform that would get them above the metal pole that runs along the bottom of the training panel. Once that was built, we started working Mugambi onto the plate holder platform. Since they are both trained to step onto a weigh board, this behavior came quickly. We then started adding elements into the session, like an old radiograph plate, a fake light generator that we designed for radiograph training other animals, loud beeps, lead vests on the trainers and cords leading to the plate. The only elements that I didn't think about desensitizing were the crossbeams created from the light generator when lining it up and the lights on the radiograph plate itself. He definitely noticed them during the first radiograph session and stepped quickly off of the platform. We ended up having to place tape on the plate to block those lights in order to help him to resume training.

We were able to obtain clear radiographs of his front feet that first session and after building another platform to allow all four feet to be elevated, I am currently training Mugambi for hind foot radiographs.

SAFETY

As with any training project with our animals, safety is at the forefront of our minds. As touched on

already in this paper, clear communication between trainers, building positive relationships and listening to our animals is key. Our zebras are free to leave a training session at any time and sometimes they do. Sometimes they are a little more agitated from guests, wind, spats with each other, etc. and we modify our training session, accordingly, perhaps not doing hoof care training and instead choosing something safer.

We also pay attention to certain “tells” from our boys that let us know whether or not they are feeling comfortable during the session. Some of those “tells” that indicate nervousness or aggression are ear pinning, stomping, kicking, tail swishing, head throwing, head shaking, skin twitching (not during fly season), eye rolling or leaving the training session. If they show signs of aggression, we pause and redirect them to a simpler behavior. If we feel that they are calmer, we will resume the training session. If they show signs of being nervous, we will go back a step and repeat that approximation until they are performing it without hesitation. We never push them beyond their comfort level yet are always challenging them to continue growing and advancing.

CONCLUSION

The animal keeper staff at Cheyenne Mountain Zoo have been able to build positive relationships with our Grant’s zebra through our successful positive reinforcement training program. By giving our zebra more control over their environment by allowing them to leave a training session or the choice to even to participate at all, and by reinforcing behaviors we would like to see more of, our zebra have thrived in their role as animal ambassadors and are participating in their own vet care.

We want everyone to know that despite some behavioral challenges typical for the species, zebra can be willing and able participants in their training programs! By taking the time to work with them and build relationships through positive reinforcement, the sky’s the limit for their behavioral repertoire.

Training the Trainers

Getting More People Involved in Behavior Management

Jennifer Diaz

Cheyenne Mountain Zoo

This paper and the accompanying presentation are largely opinion based. There was no research performed, sources to site, or supplemental reading. My intent is more to inspire with examples (and lots of videos) than to convince with well thought out logical arguments. I did my best to transfer the very visual presentation and accompanying storytelling into a formal paper. Just be aware that it definitely loses something in the translation.

We all agree that the lives of animals in every situation from zoos to shelters and from backyards to the front range, can be greatly improved and enriched through behavioral management. The only question then is “how?” You are only one person. How many animals’ lives can you possibly impact? There are hundreds of amazing animal trainers in the world, but if we can multiply that number by thousands, we can reach an exponential number of animals’ lives.

It is common practice in many facilities (not just zoos), for the most experienced and best trainers to do the majority of all animal training. But how do you become an experienced animal trainer? How do you hone your skills to become one of the best? The answer is simple: someone gives you a chance and helps coach you through the learning process. So, our duty as the most experienced trainers is not to do all the training ourselves, but to help others the way we once were.

Anyone of any age can learn. In the EdVenture department at Cheyenne Mountain Zoo, we try to get everyone involved. Teen program participants train snakes and salamanders, staff leading birthday parties fly birds, docents train lizards to voluntarily shift out for guest interaction, and so much more. I will go over some steps that can be taken to open up more opportunities for both the animals and the people at your facilities. Through the implementation of these ideas, we have more than doubled the number of animals in our education collection who are regularly trained, expanded our thinking for who and how to train, and mentored over 100 humans who have gone out into the world with a better understanding and passion for training.

Who should be trained and who should do the training?

The largest obstacles to generalizing the art of training are the misconceptions surrounding the idea of which animals should be trained and which jobs need the skills of good trainers. Significant strides in animal empowerment and behavior modification have been made in the past few decades. This is partially due to increased understanding about what drives behavior and the need for mental stimulation in animals with higher intelligence. For many animals such as primates, parrots, elephants, and dolphins, we agree that, not only is it possible, but it is an ethical necessity to train and enrich these animals when they live in human care. So let's continue this momentum that has started in recent years. All animals can benefit from choice and control over their environment. Injection training the tiger creates a safer, less stressful medical procedure for both vet staff and cat. So why not give the rabbit or chinchilla the same option for voluntary participation in vet care? If behaviors designed to simulate natural hunting or foraging can reduce stereotypic behaviors in primates and large carnivores, why not bearded dragons and salamanders? In short: almost every animal, in almost every situation, can benefit from some sort of training. Zoo inhabitants aren't the only ones to benefit either. Classroom pets, livestock, companion animals, and

even working animals receive the same benefits. So why not give it a try?

Now the question becomes: who should do all this training? We all know amazing trainers. Maybe you are an amazing trainer yourself, but you can't train them all by yourself. Just as all animals can benefit from being trained, it is not just zoo keepers and professional dog trainers that benefit from having these skills. Every pet owner in the world would find their lives easier with better technique. Wildlife managers can adjust antecedent arrangements to set up wildlife for success in a variety of situations. Even people who don't interact with animals on a daily basis can use the principles of behavior modification in their lives. So, let's get to work spreading the word!

Creating great trainers from beginners

It is not enough to say, "everyone should learn to train." The number one thing great animal trainers can do to increase the impact they have on the lives of animal everywhere is to mentor another trainer. Just like most skills in life, becoming a good trainer starts with the theory and concepts. There are several excellent books, classes, and other resources out there for people to get a good introduction to the concepts. However, that is only a start. Most trainers can agree that good training is more of an art than a science. To truly perfect any skill in art, nothing is better than practice. There are some out there who can take the book and practice on their own until they master the skills. On the other hand, most of us need a little more help. Teachers and coaches can help us spot our mistakes and mentor us through the challenges we face. Training is no different. New trainers need feedback and support from more experienced trainers so they can excel.

Training people can be just like training animals

Although being good at something doesn't automatically mean you know how to teach it, animal trainers have a distinct advantage. Just train people the same way you train animals. All the same principles apply! Create a training plan for your student. I don't mean write a training plan for them to follow in order to teach a lizard to target, I mean create a training plan that you will follow to teach your student to train. Good training plans have small approximations. The same applies to this process. Interns can't train a gorilla to participate in an ultrasound on their first behavior anymore than the gorilla can learn to participate in a voluntary ultrasound on the first session. Starting with simple behaviors allows new trainers to learn the concepts, perfect their bridge, and know when to move on to the next approximation. Remember, repetition builds confidence for both the trainer and the trainee. Most importantly, don't forget to cut both your student and yourself some slack. We are very good at taking a step back to the last approximation with no hesitation for animals that lose their momentum. Trainers should do the same thing. Students are learning the new skills of training animals and you are learning the new skills of training people. Mistakes made will not derail the learning process for people any more than they will for animals. Finally, don't forget your positive reinforcement! We know animals learn faster and try harder when positive reinforcement is used as the consequence. Your student will learn the same way.

Just as training all animals is not the same, training all people won't be the same either. We have all had the experience of designing our perfectly prepared training plan, only to have the animal skip the first 5 steps. Inevitably they then get stuck on one step that you must break into 3 more approximations to work past. People will be the same way. Your skill at meeting the animal where they are is all the more important when working with people. Some concepts will be harder to master, and others perfected in minutes. Just keep your eyes and ears open so you can focus on the moment. You can also help them by arranging the antecedents to give them the best chance for success. If a keeper worked with hoof stock before coming to your zoo, don't give them a parrot to train. Instead, look for something that learns in a similar way. If a volunteer has only ever trained a dog before, maybe let them try with a hedgehog before asking them to train a frog.

Where to start

Even though there is always too much work to be done, with not enough people or time to get it all done, try to find moments when you can squeeze in training for people as well as the animals. This doesn't have

to take a huge chunk of your day if you start small. Allowing new trainers to watch training sessions with other trainers is one of the best ways to learn. It can seem like a waste of time but will pay off in the end. The most important step is to just let them try! Remember, practice makes perfect. A great way for new people to get their feet wet is to have them partner with more experienced trainers on two-person behaviors. A good example is flying a bird glove to glove. The expert eye is right there to watch the bird's behavior and give immediate feedback to the technique of the new person. In the Loft, we don't have only keepers helping with these behaviors, but docents, teens, and even guests! The next step can be to learn some of the already established behaviors for the collection animals. This also gives them a foundation upon which to build new behaviors.

For most of you, there will be several concerns about the wisdom and safety of allowing "green" trainers loose on the animals under your care. Some steps can be taken to help alleviate some of the stress. First off, look for the right animals for the students to start with. Pairing more experienced "bomb-proof" animals with new trainers will allow the humans to make more mistakes without setting back the training too far, since they already have a good idea how this process works. Also, look for nonessential animals or "fluff" behaviors. If you have to get the lion crate trained for a transfer, this is where the most experienced trainer takes point. But what about letting the new kid train a different lion to station in the yard? Or train one of the meerkats to target? If they succeed, great! It will be good for the animals, practice for the trainer, and probably more fun for the guests to see. If they hit a roadblock and aren't able to complete that behavior, oh well. You don't lose anything by trying. Try to have new trainers start with simple, quick behaviors that will help build their own confidence as well as the animal's. Some great examples are target, spin, stand, and station.

It is also important to allow them to try things their own way. We have a good idea of how we would train a given behavior to a new animal, but don't forget that new and different ideas are not wrong, just different. I recently challenged 7 staff members to train the same behavior (voluntary injections) to 11 different animals and ended up with at least 7 different methods. Being able to try their own ideas can help people work through the process in more depth which leads to greater understanding.

The same can be said for allowing them try new things that you might not have thought of yourself. If someone is passionate about a certain animal or certain behavior, they are going to bring that energy to their training sessions. I have had keepers from zoos across the country asking me how we managed to target train our snake. In reality, all I did was say "yes" when the teens in our Junior Zoo Keeper program asked me if they could try it. I helped them, watched their sessions, and gave them pointers, but the idea and hard work was all theirs.

Benefits: both expected and unexpected

Encouraging others to take up the training mantel has some expected benefits. Possibly the best of which is that animals a single keeper would probably never have the time to train have the opportunity to participate and show their stuff. Lizards target training, chickens running agility courses, and frogs stationing are just a few examples. This also results in better animal visibility and more up-close interactions for your guests.

There will also be some benefits you aren't expecting. New ideas come to the table that might never have occurred to keepers who have been in the field for over a decade, such as using novel substrates as reinforcers for snakes rather than food. Enlisting the help of others can also take advantage of their time. They might be able to persist on a difficult behavior that you might have to abandon in lieu of "higher priority" things. In addition, it's great when these people in which you have helped to foster a love of animals and training go on to other zoos, but it can be just as, if not more, rewarding to spread the knowledge to other professions. We had one part-time keeper move on to medical school. I'm not sure how she is using her training skills as a pediatrician, but I'm still happy to know she is out there with the tools of operant conditioning in her back pocket.

Finally, one of the most rewarding surprises is that it opens the door for individual animal/ keeper con-

nections. As much as I want to think that because I have worked with these animals the longest, I should also have the most solid relationship with them, I cannot deny the affinity some animals show to specific keepers or volunteers. I have watched an animal progress through challenges I struggled with for years in just a few weeks with someone they “like” better.

Conclusion

In short, behavior modification is a skill everyone can use in their everyday lives. It’s time to stop guarding it like top-secret information. Give those with a passion for learning the first shot and see where it takes you. Just as you can’t train every animal in the collection yourself, you won’t be able to coach every person at your facility by yourself. So, use these suggestions, start small, forgive yourself for your mistakes, and move on. “A journey of a thousand miles begins with a single step (or intern).”

The Lone Wolf: Early Stages of Wolf Eel Target Training

Shelly L. Pettit

Oregon Zoo

*The introduction of wolfeels (*Anarrhichthys ocellatus*) to large and species diverse aquariums can change the feeding dynamics and call for special feeding techniques. In 2016, a young female wolf eel was introduced to a 19,000 gallon coldwater marine exhibit. Due to the shy nature and previous husbandry techniques of the animal, direct feedings were impossible and the use of SCUBA divers as a food source became the only option. Soon after being introduced to the aquarium and diver feedings, a minor incident occurred involving a diver and a confused, hungry wolfeel. This prompted the beginning of a target style feed training, specifically designed for the wolfeel. As training progressed, ultimately so did the goals associated with the training. Currently the wolfeel can successfully target feed with one or two divers in the water, and moving forward, the goal has moved toward the wolfeel completing the 23 foot swim to the surface of the exhibit to feed from the top. The target training has progressed over the years and since the initial training there have been zero negative incidents towards divers. The training has also increased the positive relationship between diver and animal and in fact lead to the discovery that the animal was in fact a male and not a female. Something that may have not been detected as quickly if the animal was not regularly being observed and examined during training sessions.*

The Oregon Zoo received a young wolf eel (*Anarrhichthys ocellatus*) in February of 2016 from a nearby aquarium facility that was closing its doors. Other animals were received in the same shipment, but this young fish seemed to receive most of the attention from the new care staff. The previous facility had little information to share about any current husbandry practices, diet preferences, or behaviors for this particular animal, and at the time, Oregon Zoo had only attempted to keep a wolf eel one other time, many years back, and unfortunately was unsuccessful due to circumstances unknown. This left the care protocol flexible and up for interpretation from the first day. Upon arrival, “Blanche” was small, scared, and like every new fish, went into a quarantine holding tank where she would spend at least the next thirty days, going through the standard quarantine protocol for fish. She was given plenty of cover, PVC hiding pipes, and fake kelp to increase comfort levels and reduce stress. A large variety of food options were offered including: shrimp, capelin, squid, clam, and herring. When those were declined at every offering, the nutrition center staff went in search of live prey items such as crab, urchins, and spotted prawns. Even these live delectables could not break her inappetence. While this is not uncommon of new fish in a quarantine situation, it was still slightly concerning. Discussion moved towards completing her quarantine without visual confirmation of eating, in order to allow her to go on exhibit, with the hope that settling into her new home would encourage her to finally eat. Veterinarians, curator, and fellow keepers agreed, and in she went.

Our Kelp Forest exhibit is 23 feet deep and approximately 19,000 gallons. It houses a variety of rockfish, perch, sea anemones, stars, and now a lone wolf eel. Due to the depth of the exhibit, the shy nature of the wolf eel, and the confirmation that the animal was not eating during the broadcast feedings intended for the other fish in the exhibit, the only way to offer the animal food was by a SCUBA diver. Before the introduction of the wolf eel, only sea anemones, and sea stars were being offered food by diver in this exhibit. The required two divers would enter the water following safety protocols for that exhibit. One diver would carry a mesh bag with food options and approach Blanche slowly. Once situ-

ated in front of the animal, the diver would present various food items near the animal waiting for either some interest or at best, consumption. This went on for over six weeks, for a total of eleven weeks without feeding since her arrival at the Zoo. Frustrations were on the rise and talk of removing the animal from exhibit and going back into holding for exams, radiographs, and even tube feeding were in play. Finally, as if Blanche has sensed what her new fate may have been, on week twelve, she decided to take both clam and capelin to fill what was no doubt, an empty stomach. This of course was a relief, and a burden had been lifted. Divers surfaced, high-fived, and the entry went into ZIMS, our facilities animal database and record keeping system. The future was wide open and this small victory was bound to lead to bigger and better things.

Diving is a task that occurs every day for a multitude of reasons at our facility and is done by both staff and volunteers. Divers entered the water once a week to feed Blanche and sometimes for other dive needs. During a cleaning dive in Kelp, Blanche had keyed in on a diver whose drysuit boot had a yellow colored sole. Clearly, and without fault, Blanche was associating divers with food and to her, this particular drysuit boot had a striking resemblance to the white, mesh, food bag that divers carried during feeds. The diver was unaware that the wolf eel was approaching as she typically did during feeds, and gave the boot a bite. Nothing hard, nothing to cause injury, but enough to make for a good story. Throughout the day, the stories of Blanche and her “attack on the diver” grew as did the realization that it was time to implement some type of feed training. Training could prevent any additional negative diver interactions and keep Blanche’s bad girl reputation at bay. After all, volunteers can choose not to dive with a “ferocious wolf eel that likes to eat feet.”

A target had to be chosen that would allow for quick identification from the animal, be easy to carry while diving, and work double duty as a feed station and target simultaneously. Ideally, the diver would hold the food bag, the target, and reward the animal in one swift motion. A simple, unmarked, pink frisbee was chosen, and altered to create a bright colored ring with a large enough diameter that “Blanche” could get easily see and retrieve food from when offered.

Sessions started out as most target training does; the target was presented only during feed dives and the food item (typically clam as it is her favorite) was held directly in the center of the target. Blanche caught on quickly and would make a focused and deliberate swim to the target when presented. Over the next year she progressed, and although always curious about divers in the water, only emerged from her resting spot when the pink ring was visible and signaling a feed session. Dive booties were finally off the menu and a new behavior had been born.

As target training evolved so did Blanche. Over the following years we added an additional identical target for the second diver that was always there because they were required per safety standards. One target would be presented at a time and once food was offered and consumed, the feeder would remove the target from sight by placing it behind the back and using a free hand encourage Blanche to turn around and see the second diver with the second target. This too has been successful and aided in a positive relationship between diver and wolf eel that was unexpected. For example, sometimes getting the food item out of the bag while wearing bulky gloves can be troublesome. Over time she learned patience for the diver as each food item had to be pulled from the bag and centered in the target. Divers will often note that “Blanche” will hover patiently in front of the target and wait, very still, and very calm, for the next piece of food to arrive target center. Another positive relationship aspect results in her allowing divers to touch, hold, and/or cradle her during feed sessions, ultimately making her a favorite animal among the dive staff and volunteers. During the initial training and due to the incident with our volunteer, the decision that only trained staff were allowed to feed Blanche or even dive in Kelp until there was full confidence in her ability to differentiate between feed dives and maintenance dives.

During the two years of dedication to training and behavior modification, another change occurred and had become obvious and startling during a feed. “Blanche” had come out for a feed session and the diver had gotten her 12 feet up into the water column. The increase in her size, girth, and overall physical appearance had been a subtle yet somehow rapid change from the scared, pale, little wolf eel that had first arrived at the Zoo. Although labeled, transferred, and referred to as a female for at least three years, “Blanche” was in fact, unmistakably, a male. Without the training and the opportunity to form a relationship with the divers, this transformation may have gone undiscovered for a significant amount of time. An an-

nouncement was made, a name change suggested, however, it appears he will always be known as “Blanche”. After all work put in from both ends, it doesn’t seem like it would be right to call him anything else.

While target training continues, ideas for the future of his training and welfare do too, including: collection planning for a female companion, enrichment ideas, and more complex target sessions. There are plans on showcasing this gentle giant for public feeds and special events thanks to his uncanny ability to “wow” people. Regardless, Blanche has brought a great new dynamic to an otherwise typical exhibit.

Fish really are spectacular animals and can be taught a variety of things if given the opportunity to learn. Small victories can open the doors to progress, ingenuity, and animal welfare for our finned friends. Sharing stories of triumphs, failures, trials, tribulations, and miracles can be a way to enhance the progression of the aquarist community. There are some amazing discoveries, resources, and genuinely incredible things happening in this field by a great group of people looking to revise and restructure what it means to be a fish keeper.

A Detailed Behavioral Approach to Rebuilding Confidence, Trust and a Positive Relationship with a Sumatran tiger (*Panthera tigris sumatrae*)

Debra Marrin, Andrew Poole, Dr. Bethany Krebs, Kimberly McIntyre
San Francisco Zoo and Gardens

*On February 21, 2017 a four-year-old female Sumatran tiger (*Panthera tigris sumatrae*) was transferred from the San Francisco Zoo to another AZA facility for an SSP breeding recommendation. She did not adjust to the new facility, nor develop positive relationships with her new caretakers. The animal was described as nervous, aggressive, and agitated for many months after the move. This behavior was different from the behavior she exhibited at the San Francisco Zoo. After more than 10 months with little progress both facilities agreed it would be best to bring the animal back to the San Francisco Zoo. Our wellness and carnivore teams did extensive evaluations of her current condition and existing management. A plan was developed prior to her return and results were evaluated on a daily basis. Adjustments were made as we let the tiger's behavior tell us when she was ready to progress. The plan and process were detailed and led to her successful positive behavior change. The tiger developed and maintains positive relationships with a large number of staff, shifts reliably, and participates in voluntary husbandry behaviors. Her dramatic change has not only improved her quality of life, it has given us the opportunity to bring in a male Sumatran tiger for breeding. This case study shows how individualized animal care and management can improve welfare while simultaneously supporting large scale goals such as the SSP breeding plan for this highly endangered species.*

A female Sumatran tiger was born at the San Francisco Zoo on February 10, 2013. She was a single cub who was mother reared and later named Jillian. Jillian lived with her mother Leanne at the San Francisco Zoo until February 21, 2017 when she was transferred to another zoo for an SSP breeding recommendation.

During her time at the San Francisco Zoo, Jillian had positive relationships with her care team, shifted reliably and participated in voluntary medical behaviors. Jillian was outgoing and confident on exhibit, and inside the lion house. She responded well to new enrichment and participated reliably in voluntary husbandry behaviors.

Though her overall demeanor was positive, keeper notes indicate Jillian exhibited undesirable behaviors towards some strangers in the building and service dogs at her exhibit window. In January of 2015, staff first reported negative reactions to service dogs. In September of 2016 staff reported Jillian having negative reactions to strangers during loud construction work around her exhibit. This carried over to negative responses to strangers in other circumstances. Despite a degree of reactivity to strangers, loud noises, and service dogs, Jillian's relationships with her care staff was consistently positive. She was generally engaged and tractable for daily management.

On February 21, 2017 Jillian was transferred from the San Francisco Zoo to another AZA facility for an SSP breeding loan. Notes from the receiving facility indicated she was bright and alert upon

arrival, but extremely aggressive. More than three months after her transfer her apparent agitation and aggression had not subsided. Attending veterinarians decided to treat Jillian with medication commonly used to treat panic attacks and phobias. The intent was that short-term use of medication along with a behavior plan would support positive behavior change and allow the cat to settle in. Even with the combination of a behavior plan and drug therapy Jillian refused to shift voluntarily. The inability to secure her reliably on a daily basis created safety concerns and made performing basic husbandry tasks difficult or impossible.

In May of 2017, discussions started between Jillian's current management staff and the SSP coordinators to consider moving Jillian to a third facility. Managers also consulted with multiple behaviorists outside their own facility to discuss Jillian's behavior and seek advice. Over time SSP coordinators felt a natural breeding for this genetically valuable animal would not be possible due to her behavior. Artificial insemination was thought to be her only chance of conceiving.

Eleven months after her transfer there was little change. Jillian had still never shifted voluntarily. She had not been weighed since her arrival. The veterinary staff described Jillian as thin and gave her a body score of 3/9 (a later sedated weight showed that she lost 21% of her pre-shipment body weight in a one year period after leaving San Francisco). She was still being described as temperamental, aggressive, agitated, extremely reactive and lacking trust in her keepers. Keepers also noted that their presence seemed to amplify Jillian's anxiety. In spite of all the efforts to modify Jillian's behavior the staff was not seeing the desired results with cooperative behaviors or relationship building. Jillian was non-reactive if she saw staff through the glass windows at the side of her exhibit, but would often snarl and occasionally lunge at them through the mesh if they were in front of the exhibit.

In November of 2017 communications began between the holding zoo and the San Francisco Zoo staffs regarding Jillian. After both institutions expressed support for moving Jillian back, the SSP coordinators approved the decision to bring Jillian back to the San Francisco Zoo.

The planning for Jillian's return included looking at her past and current management practices and the results. We researched the medication she was on that was meant to help solve the behavioral issues and reduce anxiety. Jillian was being given a medication commonly used to treat separation anxiety, fear aggression, and fear of fireworks in companion animals. The medication was intended to support the behavior plan by reducing anxiety and increasing confidence thus allowing the cat to develop new behavioral responses to situations that previously elicited fear behaviors.

The behavioral symptoms Jillian exhibited after her transfer led us to research stressor-related disorders in both people and animals (American Psychological Association, 2013). We investigated how such behaviors are understood in the psychiatric literature, expecting this might help us understand the tiger's behavior and plan a course of action. Stressor-related disorders are often associated with behavioral expressions of aggression, high arousal, emotional detachment, increased anxiety and exaggerated reactivity (American Psychological Association, 2013; Charney, Deutch, Krystal, Southwick & Davis, 1993; Foa & Meadows, 1997; Parsons & Ressler, 2013; van Etten & Taylor, 1998). There appeared to be overlap between these symptoms and some of the behaviors that Jillian exhibited. The publications gave us insights to how the transfer could have caused the drastic, long term changes in her behavior. They also gave us ideas on how to help manage her upon her return.

Planning and preparation for Jillian's return were based on evaluating her history at both facilities. Both institutions have been successful in the past receiving and acclimating tigers to their facilities. Jillian's case was very unusual and a new experience for both institutions. For a different animal the transfer may have been uneventful, or the management plan could have successfully changed her behavior.

Based on information gathered from records and conversations with staff, we identified several

areas where we thought we might be able to help Jillian gain confidence and re-acclimate to San Francisco Zoo. We wanted to highlight clear communication (Rimpley & Buchanan-Smith, 2013; Hall, Robinson & Buchanan-Smith, 2015), building positive relationships, giving her as many positive opportunities as possible during the day and giving her choice and control in daily activities (Bassett & Buchanan-Smith, 2007). We set plans that would provide her with clear communication of what to expect and what was happening in her environment. We gave her choice and control as much as possible and focused on building positive relationships with staff. We expected it could take many months to meet all of the behavior goals we set for Jillian, given the extreme nature of her behavioral changes.

The first meeting at the San Francisco Zoo to plan for Jillian's return included the wellness team, carnivore curators, and veterinary staff. We decided to use the quarantine space inside of the lion house where Jillian had been previously housed instead of the more isolated carnivore quarantine. There were two reasons we felt this would be best for Jillian. First it would eliminate an extra move and probable darting scenario. Secondly we felt the familiar location and the presence of other animals would help create a positive environment for Jillian, who had lived in a building with other cats her whole life before moving. We also discussed how to begin weaning her off of the medication. The dosage would need to be reduced slowly to prevent negative effects. We planned on waiting 3-7 days after her return to make any changes and then start reducing her dosage at one week intervals as long as her behavior indicators remained positive.

With the veterinary aspects of her care set, additional meetings were held with the wellness and carnivore staffs to set behavior goals and management strategies. We first wanted to eliminate or reduce undesirable behaviors such as aggression and hypervigilance, including Jillian's seemingly automatic open-mouthed hiss she exhibited towards people when they first appeared in close proximity. We also wanted to simultaneously increase desired behaviors such as shifting voluntarily inside, recall and securing from the outside and positive relationships with the staff. We expected working towards these goals would help improve her psychological well-being by reducing anxiety, building her confidence, and developing trusting relationships with staff. We started Jillian's management with a detailed plan keeping in mind that the plan would be evaluated and adjusted daily dependent upon Jillian's behavior. Her behavior would tell us if changes were needed or appropriate for progress.

One of the best resources we had for monitoring and evaluating Jillian was our camera system. We could observe her remotely in all four rooms she had access to and the inside of the nest box. This allowed us to observe her behavior while alone and while engaging with her care staff. We could make decisions in the moment whether to enter for a feed or wait. We could observe each other's interactions and use that information to accurately evaluate results and maintain consistency among staff. The ability to observe her remotely 24 hours a day provided valuable information regarding her welfare and progress.

Clear communication among staff and between staff and Jillian was essential for success. We strove to communicate clearly to Jillian what would be happening in her environment in order to build her confidence and build trust. Jillian's keepers at the other facility noted that she did not want to enter the building when keepers were present. Our lion house quarantine space would expose Jillian to sounds of people in the building all day. In order to create an environment where she could relax we created a very simple way to communicate to her when people would enter her two quarantine privacy rooms. The human door to her two quarantine rooms had a sign that said "Knock Three Times Before Opening". Jillian quickly learned that no one entered unannounced. She could relax, eat, and engage with enrichment without unexpected people entering (Rimpley & Buchanan-Smith, 2013). The quarantine rooms included a den box. When the knocks at the door occurred Jillian could choose to stay out in the open, or retreat to the den box. Jillian was always given an escape from strangers. Strangers were not allowed into the two quarantine rooms of her holding spaces but they were allowed into the main building where she had access to two additional rooms.

If anyone other than known staff was present or coming into the building she could choose to leave the main building and retreat to a private space. By communicating clearly what was about to happen in the building and giving her access to private space, Jillian was able to make meaningful choices in her daily life and regain a sense of control and confidence.

In addition to knocking before entering her private space, we verbally signaled closing and opening of all enclosure doors (Hall, Robinson & Buchanan-Smith, 2015). Prior to movement we would tell her either, “Jillian opening,” or “Jillian closing”. She was never trapped and had the choice to move or remain where she was. Depending on her location, behavior, and our reason for closing or opening the door on most occasions she was reinforced by staff while doors moved. In some situations we had one person feeding and one person moving doors. In other situations we had one person do both at the same time. If she chose to remain in the den box we would not ask her to come out, but we still used the verbal door cues to communicate what we were doing.

All staff were cautious in their activities to prevent startling Jillian or causing aggression. Any negative or aggressive behavior was ignored. This included her automatic open mouth hissing that occurred when people approached her when she first returned. Interestingly this behavior was often followed by positive interactions that were reinforced and the behavior extinguished. We clearly communicated to Jillian which behaviors were desirable, which helped set her up to succeed and build her confidence about interacting with staff.

Our communication with each other included working together, daily meetings and written guidelines that were continually updated. The primary Lion House Keeper and Director of Training and Behavioral Husbandry were the leaders of the planning and implementation of the plans. They worked together on common work days and took separate days off. Preplanned management changes were set together and implemented when both were in. When flexibility was needed there was always one of the project leaders present to make decisions. By establishing clear communication among staff working with Jillian, we were able to maintain consistency for Jillian during her transition.

Jillian’s management plan included a minimum of three feeding opportunities per day. This number was always surpassed. Her first feed every day included her medication with minimal behavioral expectations, and Jillian was not required to interact with staff to obtain food. Jillian was offered her full diet every day regardless of her participation in training. Any diet she did not consume through enrichment and training would be left for her at the end of each day. Our feeding strategies were intended to provide multiple positive opportunities for Jillian throughout her day and to provide opportunities for choice and control in how or when she felt most comfortable eating.

We were careful to not reinforce aggression and focused on reinforcing positive behaviors whenever possible. We utilized what we called the “Treasure Chest of Opportunistic Reinforcers”. This was an ice chest with goats’ milk and high value food items that could be offered to her at any time of day when she chose to interact with staff or exhibited positive behavior towards people not part of her care team. We used it to change her feelings towards strangers in the building, build our relationships, and give her more opportunities to acquire rewards.

Our top behavioral goals for management were for her to shift inside the building and voluntarily secure from the outside once quarantine was over. We utilized all of her previously conditioned cues and bridges when we started asking her for behaviors. Initially we added the cues as the behaviors were naturally occurring to refresh them. For example we would stand in her view with food and as she was already walking towards us we would add in the verbal recall “Jillian Come”. We placed a weighing platform in one of her rooms and after a short period of time she started laying on it on her own. Staff would opportunistically reinforce this with goat’s milk. The cue was added back in once Jillian was comfortable lying on the platform with staff present. This strategy worked well with multiple behaviors because we

let her tell us when she was ready to progress. Once refreshed and under stimulus control we could ask for the behaviors at any time.

In addition to her verbal recall we conditioned her to a cow bell recall. The bell signaled a feeding/ or enrichment opportunity that did not need to include interacting with people. The food and/or enrichment would be placed in a room, the door would be opened, the bell would ring, and she would have the choice to shift and take advantage of the opportunity at that point or a later time. This allowed Jillian to both have access to positive opportunities and make choices about how and when to engage with them.

Enrichment was also a big part of her management plan. We set a minimum of two enrichment opportunities per day not including training and social time with staff. Opportunities that allowed her to investigate, exert control, and acquire rewards were considered important, but the goal was to provide a variety of enrichment. Jillian interacted with everything provided; one of her favorite opportunities was social time with our male Amur tiger. Their interactions did not allow them to share space but both were enriched by mesh to mesh interactions once the quarantine period ended.

The presence of the male Amur tiger, and Jillian's parents in the building appeared to be positive for Jillian and lent her a sense of confidence. We used this knowledge to condition a positive attitude to a large variety of visitors and add in additional staff who could work with her. When her parents were brought in for a daily training session which included hospital staff Jillian would choose to lie in the main building to observe. During these times we would give the hospital staff opportunities to give Jillian goats' milk and food. This had a positive effect on her reaction to strangers and helped work vet staff back into her medical training. They also did regular visual inspections of Jillian while she remained calm.

Since Jillian's management plan outlined all aspects of her care we developed a form that would allow us to see all of the components together. We documented her diet intake, medication dose and compliance, feeding, training, enrichment opportunities, and additional notes.

Jillian met and exceeded our behavior goals and expectations. The learning curve didn't go straight up but progress was steady and measurable. She has positive interactions with staff members and makes voluntary appearances for keeper talks and tours in the building. She shifts reliably within the building and from the outside since her first day out. She seeks keeper interactions and participates in voluntary husbandry behaviors. We achieved our first voluntary weight March 16, 2018, less than one month after her return. She was placed on a bi-monthly weighing schedule which allowed us to monitor her weight gain and slowly adjust her diet to reach her goal weight. Once her scale behavior was established, we progressed to injection training and building Jillian's relationship with vet staff. Mock injections were practiced for 3 months; she received her annual vaccination voluntarily on February 2, 2019, just under one year after her return. She is on a maintenance schedule for established behaviors and is starting on a new goal of voluntary ultrasound exam.

Zoos transfer animals regularly for a variety of reasons. Our facility and Jillian's previous home have both been successful in the past receiving and acclimating tigers to their facilities. Like fear disorders in humans, we don't know why some animals experiencing the same circumstances can be affected so differently. Jillian's case was very unusual and a new experience for both facilities. Luckily for Jillian we were able to dedicate the necessary resources and develop a plan that brought her back to a positive state of welfare. The bonus for Jillian and the Sumatran tiger SSP is her behavior change also allowed us to bring in a mate for her. With introductions underway we are hoping that this once difficult to manage cat will successfully breed and rear healthy offspring. Jillian's positive behavior change has helped her to reach a positive state of welfare while simultaneously supporting the large scale goal of the SSP breeding plan for this highly endangered species.

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Working Together Through Operant Conditioning to Improve Animal Welfare For Orangutans in Borneo

Cydney Sines

Oregon Zoo

*What happens when operant conditioning becomes more than an element of your work and instead could help save lives in the wild and in sanctuaries? The Oregon Zoo teamed up with the Borneo Orangutan Survival Foundation to do just that. Primate keepers Colleen Reed and Cydney Sines joined training and behavior consultant, Barbara Heidenreich, in the Bornean rainforest to better the lives of orangutans (*Pongo pygmaeus*) through positive reinforcement training. The team worked with a range of ages, from unreleasable adult orangutans to younger animals who may be released back to the forest. Work included body presentation, target training, wound treatment, nail treatment, injection training, separation training, decreased aggression, reducing fear responses, and physical therapy. The program was a challenge, but both the trainers and trainees achieved benefits and a lasting impact. Armed with the experience and knowledge of what is required to succeed, the team is planning to expand this collaboration with involvement and support from other facilities. They need your assistance to have a lasting impact on the individuals being cared for in sanctuary, as well as help to ensure the future of the species in the wild.*

Last year, Oregon Zoo primate keepers Colleen Reed, and Cydney Sines traveled with animal training consultant, Barbara Heidenreich on two trips to Borneo to work with the Borneo Orangutan Survival Foundation (BOSF). The goal was to help improve animal welfare by teaching their staff how to improve care for animals living in long-term sanctuary and prepare animals for release back to the forest through operant conditioning. The team worked well by combining individual strengths. Barbara focused on teaching the staff training fundamentals; Colleen and Cydney specialized in the hands-on work with the primates.

BOSF is an Indonesian, non-government organization, founded in 1991 with the goal of helping orphaned orangutans. Since then, their work has expanded greatly including, orangutan rescue, rehabilitation, and releases back to the forest. In addition, they work with the government to protect the existing forest in Borneo and apply pressure on the government to enforce the laws which protect those forests and the animals within. In the last five years, BOSF released 386 individuals back to the wild. In 2018, they reported 15 wild births from animals they've released, some of which were second generation. On top of all the work they do for orangutans, they also house and care for more than 50 adult sun bears (*Helarctos malayanus*) that cannot be returned to the wild.

Bornean orangutans are critically endangered, with approximately 57,000 left in the wild. They are routinely displaced and orphaned in logging and palm oil areas when mothers are killed. There is also an active, but illegal, orangutan pet trade in Southeast Asia. Due to the intrusiveness of loggers and the detrimental pet trade, there is a continual need for infants to be rescued and rehabilitated. The work done by BOSF, and organizations like it, is critical because raising an infant orangutan from infancy to release is a labor and time intensive process. In a natural situation, an infant would be with its mother learning critical survival skills for approximately eight years; without human intervention these orphaned youngsters would have no chance of survival.

The Oregon Zoo got involved after Jamartin Sihite, the director of BOSF, visited and saw the

training with the apes. He saw voluntary blood draws and other medical behaviors with the orangutans and asked to teach his staff. Specifically, to work with the tuberculosis-positive (TB+) and other non-releasable animals on injection training and voluntary blood draws to better track and treat the animals' health issues and decrease how often anesthesia is needed.

Colleen, Barbara, and Cydney arrived in Borneo with the goal of teaching BOSF staff to train medical behaviors to the TB+ and medically fragile orangutans in their care. However, there was the opportunity to do so much more. On the initial trip in the spring of 2018, we were stationed at BOSF's smaller site Samboja Lestari, located in East Kalimantan. We had big goals on arrival, but knew we would have to be flexible with our expectations. Upon arrival, much of the staff did not know the fundamentals of operant conditioning, and some needed help understanding the value that operant conditioning offered both the animals and staff. Many were enthusiastic and excited to learn, but most were young and inexperienced when it came to animal training.

We had a plan for staff training. Our first step was to observe the current method of animal management. The biggest challenges were administering daily medications, sedating animals for medical procedures, and shifting. The next step was a PowerPoint presentation for the staff done by Barbara. She discussed basic operant conditioning concepts and showed videos with examples. The following step was hands-on training demonstrations with their staff. We demonstrated simple techniques like targeting and more complex behaviors like voluntary injections. The last part of our training plan was to let the staff practice and hand the behaviors off to them. This was the most exciting part for all of us; the staff was so excited to see the kind of progress that could be made in a short amount of time! Immediately, the staff saw how operant conditioning could enhance their relationships with the animals.

After the initial observations and presentations, we jumped into working with the sun bears. The bears housed at BOSF are primarily on the high end of their life expectancy and lack the skills they need to survive in the wild. Because of this, the behaviors we worked on were designed to help the staff better care for them in their current situation rather than behaviors to prepare them for release. After observing current animal management practices and talking to staff, the focus was on shift training, crating, targeting, foot presentation, and injection training. The bear staff had very little background or experience in animal training, but we progressed due to the receptiveness of the staff.

After our time with the bears and their caretakers, we worked with individually housed adult orangutans, on hand targeting, mouth targeting for nebulizer treatment, injection training, desensitization to iodine spray to treat fungal infections, and "give" to retrieve items from cages since many cannot be shifted for cleaning. Most of these individuals were not release candidates due to age and skill level or they were being treated for health issues and would eventually be released. Our goal was to help the staff improve the quality of care for the long term orangutans and to treat successfully the ones that had health issues increasing their chances of release. We had a lot of success in this area as these animals were desperate for attention and responded very well to the training.

One of the first individuals worked was Chris-John, an adult male orangutan that was rescued from a circus type environment. He was imprinted on people and lacked the skills needed to be a release candidate. He was housed in an outdoor mesh enclosure, with the eventual goal of getting him onto one of BOSF's protected islands. We started with him because he was comfortable around people and eager to train. Four training sessions were completed, some lasting up to 90 minutes before he was satiated or lost interest!

Our main goal with him was to teach the vet staff how to train an animal for voluntary injections, however, the space he was housed in made the goal challenging. The limited space made it challenging to get him in the right position, in addition to figuring out how to work safely with a potentially grabby animal. This ended up as multi-step process:

We started training him to target his hand to our hands to use the targeting to position him for injection, with the goal of getting him to press his right shoulder against the mesh to be touched. Getting him in the position needed proved to be the most challenging part!

When we couldn't get him to sit with his arm tightly in the corner, we introduced a second step which was another person touching his shoulder with a stick and reinforcing pushing his arm into the stick hoping he would start to move closer to the corner. Unfortunately, he wasn't making the connection and we were very limited on time.

The last resort was to have him twist his body into a position that would force his shoulder into that corner. What that looked like was targeting his right hand to our left hand down low in front of him, across his body, causing him to drop his shoulder.

When he touched the trainer's hand, he would be rewarded with food straight to his mouth in a position that forced him to lean even further into the mesh.

Once he was leaning into the mesh the second person, who happened to be the vet, started touching him with a stick, then a paperclip, and finally a dull needle. We were all ecstatic when the behavior finally clicked. It was exciting to see what progress could be made in a short time and a challenging situation!

The last area worked on our first trip was the TB+ unit. With these animals we taught hand and mouth targeting, but mostly focused on shift training, which was the biggest challenge they were facing. These animals were housed in groups with males rotated in with groups of females. As expected, it was very challenging to shift males away from the females when they knew another male would be shifted in with them. Here the biggest challenge was to help the keepers build trust, they had been baiting animals for so long that the trust had completely deteriorated. There was an adult male named Mike who was one of the toughest males to deal with. He was hard to move out of the group rooms; when staff tried to shift him he would throw doors or refuse to move away from the females. The staff named him after Mike Tyson because he had a history of biting or trying to bite the staff working with him. We had our work cut out for us, but the approach was simple. Build trust from the beginning by offering him things he liked. We started by teaching him to target to a ball on a stick and used the target to get him to move where we wanted. Once in the desired location, he was reinforced for staying while moving doors around him. Within a few short training sessions, he was moving and allowing doors to close and not once did he try to bite. The staff was blown away by what building a little trust could do.

On the trip the following fall, we went back to Samboja Lestari and worked with new staff on the aforementioned behaviors in addition to troubleshooting issues that had come up since the previous visit. The second half of the trip, we traveled to Nyaru Menteng, in Central Kalimantan. Nyaru Menteng is BOSF's larger site with some 400 orangutans. We arrived with similar expectations for training as in the previous trip to Samboja. We immediately started working with the staff, primarily the veterinarians, teaching them the concept and benefits of positive reinforcement training, again with the goal of being able to better treat and assess the adult animals in their care. This time the staff was better prepared for our arrival; they were incredibly enthusiastic about learning and had a lot of previous knowledge and experience with animals, despite their lack of knowledge of operant conditioning. We followed the same process to train the staff as we did at Samboja. We started with some basic behaviors like hand and mouth targeting and then transitioned to more complex behaviors. Training focused on the needs communicated to us by staff, which were wound treatment, open mouth, injections and nail trims. We also worked on helping them develop relationships with nervous or traumatized animals through positive reinforcement.

After a couple of days, we learned the nursery and forest school staff were having issues with multiple uncooperative youngsters. One problem was with some of the adolescents leaving school mid-day and not staying to learn the skills needed to survive in the wild. To demonstrate how to address this issue, we worked with an individual named Luti, a four-year-old female attending forest school. Every day the babysitters take around 20 orangutans between the age of three and six out to the forest. Here, the animals are supposed to spend the day learning the skills they need to survive in the wild.

Luti was a special case; every morning she would make the hour-long trek out into the jungle with her class and every morning she would disappear and return home. Luti decided home had more good things than the forest. The problem is if Luti doesn't stay at school while she is young, she will not learn the skills she needs for release and once she gets bigger she will be too big for the babysitters to safely handle in the forest. This will leave them no choice but to keep her in long term sanctuary.

She needed a way to motivate her to stay in the forest without being in direct contact with humans. That was accomplished by making treat packets with bananas and raisins wrapped in leaves and hiding them around the forest where she was hanging out. Initially, she was shown where the packets were hiding, but very quickly she started searching her surroundings on her own and was rewarded by discovering the packets in a variety of locations. It was very simple, the forest needs to be more reinforcing than going home. This concept was taught to the staff in hopes that they will continue to apply it to the other animals going through forest school to increase the number of animals that can be released. Since then, Luti has been moved to a pre-release island and is doing well.

Another issue was some of the youngest animals in the nursery were starting to show behaviors that could potentially lead to aggression such as grabbing and biting at people's feet. Left unaddressed in youth, this can jeopardize the opportunity to attend forest school due to the babysitter's inability to control their behavior as they grow bigger and stronger. The goal was to show the staff how to use positive reinforcement to motivate the babies in the nursery to stop doing the undesired behavior.

A constant issue with raising young orangutans is for them to be too clingy or grabby with people. In the wild it would be okay for a young orangutan to roughhouse with his or her mom, but in a captive situation this can quickly become dangerous for the people caring for the animal, especially as the animal gets older and stronger. There were always individuals who wanted to push the boundaries to see what they could get away with. Two youngsters were having issues along these lines; one was too clingy with people and the other was biting at people's feet. Both were between one and two years old, so this behavior, while annoying, was manageable. The way the staff typically handled this was by holding the animal's arm and moving them away from the situation. This technique worked decently but did not deal with the root problem and was not going to work as the animal got bigger.

We worked with the staff on a technique of catching the animal doing the desired behavior (i.e. calm behavior) and reinforcing it. When the animals were playing, climbing, standing calmly or engaging in any behavior that wasn't clinging or biting at feet, they would get a small reward and if they were doing the undesirable behavior they would be ignored. We went as far as training one to go from one person to the next, following a pointed finger and if they approached the next person calmly and didn't get grabby, they would be rewarded. The staff was very excited to see that calm behavior could be taught to two of their most challenging kids in just one 20-minute training session! We were hopeful this principle would continue to be applied with other youngsters. As with all the training, the goal was to teach the staff to appropriately handle situations in the future without assistance.

One other individual stands out above the rest. Sandra is a partially paralyzed adult orangutan. She had difficulty moving through her area, grasping food, and was fearful of people. She would vocalize and become aggressive when people got too close to her cage, swinging her hands at them until they backed away. We saw several areas to help Sandra. Recommendations were made on ways to make her cage easier to move around and modifications that would give her more comfortable places to rest. We also slowly introduced people to her without invoking a fear response. This required finding food she loved, moving very slowly and allowing her to progress at her own pace, stopping the moment we felt she was going to start showing a fear response. In just one short training session she was calmly taking food by hand. From there we focused on providing her with physical therapy to get her moving and stretching properly. While she was slow, she was eager, and after just two sessions she was taking food from staff that previously could not approach her area without triggering a fear response. Building the connection between staff and Sandra was crucial to bettering her welfare. The staff was absolutely blown away by the difference they saw in her so quickly, and all of it was simply due to making the interactions with her positive and rewarding.

As previously stated, the goal of this work was to equip the staff with the skills to train these behaviors on their own. Most of the staff was incredibly enthusiastic about learning how to train animals. Seeing the progress that could be made in a very short training session was incredibly motivating for them and gave them a lot of hope for what could be accomplished in the future. The plan is to have a group of trainers go to Borneo to work with the staff every six months for the next couple of years. This is something they can do without us. The plan is not to go there indefinitely, but rather to give them skills they need to train behaviors on their own and that is a totally realistic goal!

Initially, we didn't understand the complexity of working in Borneo and with the staff at BOSF. Helping the staff understand and appreciate the need for operant conditioning was a big hurdle, especially with the language barrier. We helped them understand how operant conditioning could make their job easier, build trust between themselves and the animals, as well as enrich the animals' lives, while giving them the ability to better treat and monitor the animals' health issues. The gratitude and understanding that came from the people that applied the knowledge was wonderful to see and the impact it had on animal welfare was inspiring. It was well worth the time and energy.

The biggest thing the three of us took away from this experience is how simple it is to impact on the world around us. You do not have to work with many people for it to have a ripple effect on the people and animals around you. After successfully hand feeding Sandra the first time, one vet told us with tears in his eyes, that he did not even recognize her, and he never thought it would be possible to have a positive relationship with her. This is life changing for both. That's just one of many examples of the people and animals that were impacted in our three-week trips. We are grateful for this opportunity to work with such incredible people and animals and excited to see where this program goes in the future.

Talking Training: Evaluating Trainers and Giving Feedback

Nicki Boyd- San Diego Zoo

Ellen Dreyer-Brevard Zoo

Steve Martin- Natural Encounters, Inc.

Trainer and training evaluations are a necessary part of capacity building with any animal program. There is often resistance, fear, and aversion of being evaluated. This workshop will highlight some of the formats, successes and strategies to encourage capacity building in a safe and nurturing environment. Animal care professionals should always be learning and part of that is understanding the science of training. The application of operant conditioning has greatly improved the welfare, animal care, and guest experience. Being able to give and receive constructive feedback is crucial to that learning and application process. This workshop will be hosted by several members of the Behavior Advisory Group (BAG) from the Association of Zoos and Aquariums (AZA) and will have interactive video for trainers to evaluate. There will be various evaluation form options to take back to their facility and use in their own programs, and live demo role-play with tactful constructive feedback and of course lots of positive reinforcement. Evaluators will be taught some of the science to go along with the feedback so that correct assessments can be given. Examples of training and interpretation to the guests will be another part of this workshop, telling our story and the great welfare advancements which are accomplished with operant conditioning should be shared. Training animals is so much fun and talking training should be too.

Importance of Evaluating Trainers

There are many benefits to training animals. One of the most important reasons is that training improves welfare by providing for animals' physical and mental health (Ramirez, 1999). Training can turn previously stressful events into positive experiences. But increasing welfare through training would not be possible without skilled trainers working with all taxa and in all departments. Developing trainer knowledge and ability includes time spent teaching the science of behavior change, modeling correct techniques, and lots of opportunity for practice. Throughout the learning process, there are many opportunities to assess a trainer's readiness to proceed and current ability. Evaluations can serve as safety checks, identify learners needing extra help, and ensure program efficacy. Being able to evaluate trainer skill is vital for providing them with useful feedback, improving techniques, increasing success with behaviors, and ultimately increasing welfare.

Developing skilled trainers is the difference between having to restrain and immobilize animals for routine care versus animals learning to participate without restraint as Figures 1 and 2 illustrate. Voluntary hoof care, blood draws, X-rays, ultrasounds, and echocardiograms become the norm when a training program has all the components necessary to maximize results. Creating a culture in which evaluations and feedback are invited rather than feared is key to achieving high levels of success. Below are examples of tools that can be used to build evaluations into a training program. It is important to remember that not every tool will work for every program and each evaluation tool should be paired with effective feedback to the trainer.



Figure 1: Zebra is immobilized for routine hoof care in 2016.



Figure 2: Zebra is trained to participate in hoof trims in 2019.

Integrating Evaluations into a Program

Evaluations should enhance current and future learning (Crisp, 2012). It is important to remember that the goal of evaluation is to help trainers improve, not to assign scores or labels. Evaluations have the potential to create anxiety and fear among the trainers being evaluated even during informal observations of training sessions. Many trainers become nervous and flustered when a supervisor or even a peer watches a training session. But research done in the education sector shows that learners improve significantly when assessments are paired with prompt feedback (Crisp, 2012), which makes being able to evaluate and provide effective feedback to trainers a necessary skill worth investing time into developing. Creating opportunities for integrating observations as part of normal routine rather than doing them only when an issue arises helps to gain acceptance of the practice and reduce fear that being watched means a trainer is doing something wrong. And, asking to observe sessions when trainers are having success gives evaluators the chance to reinforce the trainer by identifying what the trainer is doing well which builds a positive association with being observed.

Many different people, not just behavioral husbandry staff or supervisors, can act as an observer, helping to evaluate training sessions and problem solve behavior challenges. Peer feedback is an extremely useful tool for improving skills. Teammates often know an animal's individual and natural history just as well as the trainer does and they may have helpful insight if asked. Having an extra set of eyes watching training is useful because they may notice something the trainer didn't. Asking a teammate to watch a training session and soliciting feedback from them is also reinforcing because it tells them their opinion is valued. Following up with how feedback has helped is further reinforcing for the observer. It is also a great way to increase influence because the person observing the session might decide to invite the trainer to watch their training sessions and may ask for feedback in return which provides them with help and ultimately benefits the animals.

Tools for Learning to Evaluate Trainers

Building a culture where teammates can give each other feedback in a supportive setting yields many benefits. But it takes practice to be able to assess a training session effectively in order to give feedback at all. One great way to practice assessing trainers is by watching recorded training sessions. Animal training videos featuring trainers of all skill levels are widely available on the internet. Using random subjects is a great way to get people comfortable with talking about training before diving into videos of each other. It

can be helpful to give trainers, especially beginners, lists of what to look for until it becomes second nature. As trainers develop their ability to assess training sessions, transition to watching videos of each other but be sure to keep participation voluntary so trainers do not feel pressured to participate until they are ready. Regularly meeting to watch videos of each other and discuss feedback is a great way to share training across departments.

When starting to build a culture of asking for and giving feedback, there are many different activities that can help people become more comfortable with the process. One activity that has proven successful in opening lines of communication is a game called “Force Feed” that is featured in *The Games People Play: A Behavioral Husbandry Activity Guide* written by Angi Millwood and Michelle Skurski and presented at the 2006 Animal Behavior Management Alliance Conference. The idea of the activity is to start a dialogue between a trainer and an observer. Prior to the start of the session the trainer describes what they are working on and what would make them feel like the session was successful. After the session, the trainer describes how it went and then the observer asks a specific set of questions. How did you feel the session went overall? What did not happen as you would have hoped? What went well? Would you do anything different next time? In return, the trainer asks the observer three questions. How do you feel the session went overall? What went well? Would you have done anything differently in this situation?

The observer and trainer do not have to agree, and the interaction is followed up with a group discussion. This activity is particularly useful for staff that are not accustomed to being observed because it lowers the pressure of being watched since everyone knows exactly what questions will be asked of them. Activities like these where trainers watch other trainers helps people be able to recognize similar characteristics in themselves and increases their understanding of assessment criteria which leads to self-improvement and has been identified as having a major impact on future success. In a study using a similar method, a group of business students were asked to discuss and grade examples from other students using a given set of criteria and provide reasons for their decisions. The study found that the students who participated in evaluating others and providing feedback had significantly better results in their own performance than those that did not (Rust et al, 2003).

Self-Assessment Tools

Self-assessments are great tools that can be used to facilitate discussions on strengths and weaknesses. The biggest benefit to self-assessment is that it helps trainers internalize the core competencies needed to be highly skilled so they can improve on their own prior to being evaluated (Gibbs & Simpson, 2005). For example, a trainer may realize after taking a self-assessment that they struggle to plan out how to train a behavior or they are sometimes unclear what to reinforce in the shaping process. Those revelations can prompt them to ask for help to improve those skills. There is often less learner anxiety around doing a self-assessment which can be done independently or in conjunction with a peer or supervisor. Differences between how trainers view themselves and how an evaluator views them should lead to productive discussions about comprehending one’s own skill level.

A great tool to become more self-aware is to record your training sessions and review them yourself. This can help you see things you might not even realize you do and is especially useful if you are having an issue and don’t have anyone that can watch you. Another tool for self-improvement is to create a competency guide for your facility to assist in trainer development. One example developed at Disney’s Animal Kingdom titled *Behavioral Husbandry Training Competencies: A Development and Coaching Guide* (2015) lists different proficiencies such as animal welfare and training, reinforcement strategies, and use of bridging stimulus with checklists to help trainers determine if they are unskilled, skilled, or overuse the skill. The guide includes remedies and suggested reading that helps with specific skill development after the person identifies areas they would like to improve.

Other Evaluation Tools

There are many more evaluation tools that are useful in training programs. When trainers are working with dangerous animals, using formal evaluations of a trainer's ability can serve as a safety check to make sure trainers are competent and using best practices so both trainer and animal remain safe. Written tests can assess knowledge of theory and vocabulary. Having set criteria for evaluating when new trainers are ready to train independently is important to keep training techniques consistent. Even adding animal training to employee reviews can serve as a motivator for some. Having categories such as animal training knowledge, animal training quality, animal training quantity, and accepting and providing feedback on reviews reminds people they are important skills that need to be focused on and practiced just like any other job skill. No matter what tools you choose to use, learning to evaluate training is an important part of capacity building in any program. The more teams practice the skills of talking training with each other, the easier it becomes. Whether you are a keeper or supervisor, be the person to set an example for the others on your team to improve relationships with your co-workers and improve the welfare of the animals.

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Evaluating the Trainer

Steve Martin

Natural Encounters, Inc.

How is a curator, veterinarian, director, or even a supervisor supposed to tell good training from average training? An expert should be more than someone who read *Don't Shoot the Dog*, has a whistle in their mouth, a clicker on their wrist, and speaks in jargon hard for non-trainers to understand. An expert trainer should be evaluated based on observable skills and knowledge. Below are a few characteristics of expert trainers.

An expert trainer uses positive reinforcement training strategies to build trusting relationships with all animals they work with, especially the human animals on their team. Exceptional team behavior is a hallmark of expert animal trainers. Building trust with any animal involves careful antecedent arrangement, clear, two-way communication, and positive reinforcement to promote desirable behavior. Expert trainers catch people doing something right and reinforce that behavior, often with recognition in the form of a simple “thank you” or “nice job.” Other trainers catch people doing something wrong and focus on the problem. Average trainers are quick to criticize others. They take the “my way or the highway” path that usually reveals how much more they must learn.

Expert trainers understand the value of prompts to help an animal understand criteria for reinforcers and promote performance of desirable behavior. Prompts are behaviors trainers employ to encourage an animal to perform a particular behavior. Prompts can be body language such as hand gestures, vocal encouragement, baiting strategies, and most anything other than a cue that can encourage an animal to perform a behavior. One large difference between an expert trainer and an average trainer is the speed with which they fade the prompts. An average trainer may continue to use prompts for days, weeks even months without fading it out of the training program. When a trainer fails to fade the prompt, it becomes the cue. By definition, prompts should be faded. Expert trainers fade prompts in conjunction with the animal's performance of each approximation. When an animal performs a behavior without hesitation an expert trainer moves to the next approximation, which often includes gradual fading of the prompt. Expert trainers often fade prompts in just a few repetitions.

Expert trainers take responsibility for the behavior of the animals they are training. When things go wrong, and things are bound to go wrong eventually, the difference between an expert and average trainer are often apparent. Experts see problems as opportunities to improve communication and understanding that will promote better learning. Average trainers often just blame the animal and wash their hands of responsibility, as if thinking it's not me being an insensitive trainer, it's the animal that's broken. Non-expert trainers often label an animal as aggressive, stupid, untrainable, messing with your mind, or more. Experts don't waste their time blaming animals; they spend their time solving problems and training behavior. When things go wrong, expert trainers evaluate the training session to discover their role in the performance of the undesirable behavior. They then develop a plan of action to promote desirable behavior. This plan often includes antecedent arrangement, clearer communication, higher rate of reinforcement, paying closer attention to body language and empowering animals with more control.

Expert trainers use clear, honest, two-way communication with animals. Clear cues, bridging stimuli, careful antecedent arrangement, exceptional observational skills are characteristics of expert trainers. Experts give cues only when animals are ready to receive them. They know the value of timing the bridging stimulus and demonstrate precise marking of small approximations of behavior. Whistles, clickers, and audible bridges are all tools of expert trainers; however, experts know that clickers and whistles are not necessary in all training sessions. In fact, clickers and whistles often get in the way of training progress and

verbal bridging stimuli, such as the word, “Good” are often the best bridging stimulus in many cases. Some people think they cannot use a verbal bridge because they have different trainers working with a particular animal and each person has a different voice. Animals easily adapt to different stimuli in their environment and easily adapt to different voices used as bridging stimuli.

Through careful observation of an animal’s body language, and responding appropriately to those signals, an expert trainer gives an animal a voice in their partner relationship. The animal’s voice, through its body language, is as important as the trainer’s voice through her cues, prompts and reinforcers. Giving an animal a voice also gives the animal a vote in its management, training and welfare.

Giving animals a voice will lead to providing more choice and control in their environment. For instance, when opening a door for an animal to shift inside, the trainer gives the animal a choice. If the animal chooses to stay outside, the trainer recognizes the reinforcers for staying outside out-compete the reinforcers for going inside. An expert trainer will then build a plan to provide reinforcers for going inside that out-compete with the reinforcers maintaining the behavior of staying in the outdoor yard. Some average trainers will simply get out the hose and squirt the animal with cold water to get it to shift.

In a case like this, an expert trainer might do a functional assessment to evaluate the reinforcers and punishers associated with the animal behavior of staying outside. By evaluating the antecedents and consequences associated with the behavior of staying outside, an expert might realize the consequence of being locked inside in the past, has become the antecedent condition for staying outside at this time. By staying outside, the animal avoids being locked inside.

An expert might deal with this problem behavior by giving the animal control over the door. If the animal is inside, a trainer can open the door anytime the animal moves in the direction of the door. High value food would be offered for staying inside as the door opens. After several repetitions the animal will learn that it has the power to open the door simply by moving in the direction of the door, and staying inside will result in high value food reinforcers. This control of the door is a primary reinforcer for the behavior of moving toward the door. Control of the door and high value food items are the reinforcers for the behavior of staying inside while the door is being closed. Each time the door is closed, high value food reinforcers are provided to the animal. Soon, the animal will stay inside when the door is opened because the food reinforcers, combined with the history of being able to open the door, outcompetes with the reinforcers of being outside. Control over the door closing and opening will also reinforce the behavior of coming inside because the animal has reinforcement history associated with being able to open the door by moving toward it. A large quantity of high value food should always be given any time the door is secured for the night.

Conclusion

To properly evaluate a person’s training expertise, one should look at many indications of skill and knowledge. Team behavior is a very important consideration when evaluating any trainer. Even more important than animal training skills, exceptional team behavior should be required for someone to move ahead in a training system. It is often easier to teach a great team player to be a contributing member of a training team than it is to teach a great trainer to be an outstanding team player.

Expert trainers give animals a voice through their body language and respond to subtle signs to empower animals with control in their environment. By giving animals a vote in how they are managed, an expert trainer increases enrichment experiences, improves training outcomes, and creates conditions that improve welfare. Expert trainers are not always the smartest in the room, but they are often the most sensitive at reading body language and arranging antecedent conditions, and reinforcement history, that promote desirable behavior.

Talking Training Workshop

By Nicki Boyd

Associate Curator, San Diego Zoo

Talking about training sessions can become a culturally accepted practice. Building the skill set to be someone who is good at giving and receiving feedback takes practice. Some resources include the book *Crucial Conversations*. The book explains how to know what you want out of your conversation. Trust is a crucial component of someone being able to receive feedback. Working on how you speak to people, talking persuasively not abrasively is a key skill set in getting your message heard. If people feel you have their best interest in mind they can take difficult feedback more openly. While it is important to give positive feedback, most people are fine with giving and receiving that so the point of this discussion will focus on the difficult conversations we need to have.

Start with Heart: this section discusses how you fill the pool of dialogue with shared meaning. Everyone has their own opinions and experiences. Make sure you do not speak when angry or learn how to calm down. Human nature and adrenalin does not set us up for success. Blood rushes from our brains to our limbs to prepare us for flight or fight! Not the best time to have an intelligent thoughtful conversation. Making it safe to talk can really help the process. When you notice it's not safe anymore i.e. people get defensive, body language changes, the dialogue stops, step out of the conversation, make it safe by apologizing, clarifying, and agreeing then step back in. Often, we assume the worse; if you can change your thinking to start with good intent, it can really change the whole outlook. When employees come with a problem and they start assuming what others are thinking, teach them to assume good intent. We are all trying to take the best care of our animals as possible. By assuming good intent, you go into a conversation wanting to hear their side and find out where they are coming from.

Practice makes perfect or at least we get better at doing it. When things go south in a conversation learn to look when safety is at risk. By apologizing you can reset the conversation; a real sincere apology means you have a change of heart. Maybe you misunderstood where they were coming from, maybe you forgot to assume good intent, choose your words wisely. Reading the book *Crucial Conversations* is just one self-help option. Being a servant leader for those in management positions can really promote trust. By mastering difficult conversations, you can manage up and down in your work environment. Training animals can be so much fun and by mastering a crucial conversation talking training can be too.

Visit www.CrucialConversations.com/exclusive to learn more techniques.

Enriching Ambassador Reptiles

Deidre J. Ousterhout

Zoo Atlanta

Enrichment is a vital part of a zoo animal's positive welfare. Often reptiles are overlooked or placed on low priority when providing them with adequate enrichment. The Ambassador Animals team at Zoo Atlanta has been working on a new scheduling and administering plan for behavior-based enrichment to ensure that all reptiles in the population receive enrichment and participate with provided enrichment. By assessing the natural history of each species as well as everyone's needs (i.e. activity level, age, health) Zoo Atlanta was able to create a behavior-based enrichment program that is designed to meet each reptile's needs. This paper will discuss the steps, considerations, and applications put forth towards successfully enriching all reptiles within the population and will also discuss how they plan on evaluating the success of the program and how to determine if improvements are needed for the future.

In 2018, Zoo Atlanta's Ambassador Animals team set the goal to improve the already good welfare of our reptiles. One of the focuses to improve reptile welfare was to better manage and improve our enrichment program. Previously the enrichment provided for our reptiles was only partially behavior based and not recorded or administered reliably. In addition to improving welfare, another goal while designing this new behavior-based enrichment program, was to make documenting and administering enrichment simple and understandable for all staff and interns involved. To create this program, we followed the S.P.I.D.E.R. framework designed by Disney's Animal Kingdom (Macphee and Mellen, 2002). Additionally, we wanted to allow those administering the enrichment to utilize their own creativity as well as work with Zoo Atlanta's already established enrichment approval process. With so many variables to balance, we had to find ways to create a more efficient product that truly enriched our animals' lives and would not add more stress, time and/or difficulty to staff and interns already busy workday. Below are the steps and considerations the Animal Ambassadors team took to create our new behavior-based enrichment program for the reptiles within our population.

With goals established it was time to move forward with planning. Zoo Atlanta's Ambassador Animal reptile population consists of 13 species with 19 individuals. Before we began planning, we asked ourselves the following questions: "What natural behaviors do we want to elicit?", "What behaviors do these animals demonstrate naturally in the wild?" and "How does nature elicit said behaviors in the wild?" looking at reptiles as a whole. From here we looked at each reptile group: Crocodylians, lizards, snakes, and turtles/tortoises. A list of behaviors was created that were determined appropriate for each group that we would aim to elicit via enrichment:

Alligator

Basking
Exercise
Foraging
Grooming
Hide
Nesting/burrowing

Lizard

Basking
Exercise
Foraging
Grooming
Hide
Nesting/Burrowing

Snake

Basking
Exercise
Grooming
Hide
Nesting/Burrowing

Turtle/Tortoise

Basking
Exercise
Foraging
Grooming
Hide
Nesting/burrowing

Staff used their knowledge of the species as well as further research to create this final list of categories. Below some categories are further explained including why it was chosen as part of our behavior-based enrichment program. Discussed are also some considerations that when determining which behavior best met the natural and zoological needs of each reptile group.

As reptiles, each animal depends on the environment to maintain their body temperature. In the wild when reptiles are cold, they bask in the sunlight for warm; or if too hot may move to a shaded area (Spelman, 2012). The Ambassador Animals team requires that all reptiles be offered a **basking** and an ambient temperature to allow them choice. So, although our reptiles already were offered choices we chose to include basking as an enrichment category as 1) it is a natural behavior that human care can easily replicate and 2) there are variations that can be made such as temperature ranges, location of temperature, and how the temperature is offered etc.

Exercise is a behavior we wished to elicit for all reptiles. The extent of everyone's exercise requirements varies as each species and individual's activity level is different. At this stage of our planning process we were simply aiming to create a list of behaviors we wished to elicit. The "how to elicit behavior" question would be answered later as the adaptations of each reptile species vary greatly from climbing, digging, running, and swimming. We look at each individual and how to elicit specifics of behavior later. Because this category is so broad, we decided to create sub-categories for exercise as can be seen/explained in the definitions below.

Foraging is another behavior listed for nearly every reptile, as in the wild they would spend time searching for food. We did choose to exclude snakes from this category to limit food aggression and potential bites to humans. Because the snakes are fed at home and are handled by Ambassador staff, education staff, and docents we determined it best for the safety of humans and animals to not take this risk.

Grooming is a behavior specific to all groups. As reptiles grow, they shed their skin. Due to the

various shedding styles of each group, the enrichment varied depending on species and where they are in their shedding process.

The reptiles in our population spend a majority of their time sitting beneath hides, out of sight. In the wild these species would rest/hide in trees, burrows, tall grasses, water, etc. Due to this we created **hide** as a category as it would be easy to replicate alternative hiding options for this common natural behavior.

Finally, many of the species in our population are fossorial, or will spend some of their life in some type of substrate. The final category we decided on was **nesting and/or burrowing**. We decided to group nesting and burrowing as the same category; although their definitions are slightly different, the goal of the behavior itself is fundamentally the same. Why create this category when digging is needed to create a burrow for certain animals? The reason is the goal itself. Digging, though necessary for production, would fall under the goal of exercise, while nesting and burrowing we chose to define as a separate goal.

Before moving forward with how to elicit these behaviors it was important that our team understood the definition of each behavior listed. We created definitions for each in terms of how it would be used within our context.

Basking- Heat source added (i.e. light or pad) to encourage animal to lie under/on or move away from heat source.

Exercise- Animal is given opportunity to move on its own either outside of its regular habitat or item is added to habitat to encourage additional movement and exploratory/investigation behaviors (i.e. olfactory) via scents, new location etc.

Climbing- Structure or perching is given to encourage animal to utilize claws/grip to move in a vertical direction.

Digging- Substrate is given to encourage animal to utilize claws/feet to move substrate.

Running- Wheel added to habitat, training session (i.e. A to B, targeting etc.) or floor time provided to encourage increased speed and activity.

Swimming- *Pertaining to Alligators:* Pool of water is given to encourage animal to swim/play.

Foraging- With use of food, encourages animals to search habitat for food.

Grooming- Addition to habitat to encourage self-maintenance.

Hide- Covering provided to animal to encourage natural hiding behavior.

Nesting/Burrowing- Substrate is given to encourage animal to create nest/burrow.

With general details and information created, to move forward we had to plan for how often each reptile would need to receive assigned enrichment. This was a challenge and a continual work in progress as there is no data as to how often reptiles need to be enriched. To establish how often each enrichment category would be given we considered each species and researched how they spent their day and how long they spent doing each of the behavior categories. More research is needed in both wild and human care to create a schedule that best suites each species natural needs, but a base line estimation was created as to frequency of each category. Table 1 displays the goal frequency for offering each category per species. It should be noted that depending on success and if keepers are able, the number of times each enrichment is offered will likely change with each evaluation that takes place. We considered a few variables when establishing the first template for how often to offer each enrichment category: natural history, the individual reptile in our population, availability of enrichment item, and staff scheduling.

Alligators

American alligators (*Alligator mississippiensis*) spend much of their time in the water. Due to the young age of the two in our population they would be a natural prey item for larger animals; therefore a hide and pool of water is always offered as in the wild, at their age, they would be under their mother's protection. A basking light is also available on land 100% of the time as wild alligators will be seen basking in the morning hours (Uga.edu, n.d.). We have also seen our individuals basking when people are not around and will also bury themselves under mulch when offered. Due to keepers witnessing them burrowing we offer nesting/

burrowing as a behavior once every other week even though research on the topic is limited. Finally, because alligators do not shed the same as other reptiles and shed more similarly to mammals in that they are constantly shedding (Alligatorleather.net, n.d) they are always offered objects to rub against to assist with the removal of their dead skin.

Snakes

The majority of snakes spend their time resting, looking for food or focusing on thermoregulation. (Fs.fed.us, n.d.) Although we chose to exclude foraging from the snakes' behavior category it is important to note that many snakes, such as ball python (*Python regius*), red-tailed boa (*Boa constrictor*), and woma python (*Aspidites ramsayi*) are ambush predators, waiting for their prey to come near. The indigo (*Drymarchon couperi*) and the woma python will hide in burrows waiting for prey. This information provided the knowledge that snakes need hides 100% of the time. All are provided with one typical hide box appropriate for their size and depending on if they are a burrowing species (woma, indigo) they are also provided with some nesting/burrowing options more often than the other species. We also must take into consideration that due to the nature of being ambassador animals, they are handled regularly by people who do not work with them daily and not familiar with each individuals' personalities and special needs. Due to the potential of startling the animals while nesting, we do not provide some snakes with nesting material 100% of the time for the safety of staff.

Many of our snake considerations to this point have been based on natural history, however a few of the individual snakes are geriatric and/or are much less active due to injuries; because of this we chose to offer exercise once every other week to these individuals. On the other end of the spectrum we have a young corn snake (*Pantherophis guttatus*) and two very active red-tailed boas. Due to age and individual activity level they are offered exercise more frequently.

Grooming was the other behavior that is somewhat directed based on the individual snake. As it is unpredictable to know when a snake will shed throughout the year, grooming enrichment such as misting, soaking, objects to rub on, are always offered during the time of shed as well as once every other week regardless of if the snake is in shed or not. In the wild if the environment is not suited for their needs, snakes will soak in water at the start of their shedding sequence to help ease the shedding process. Once the shedding of old skin takes place, they rub on rough objects to assist with the removal process (Fs.fed.us, n.d.). Our goal is to match these environments to help ease the shedding process for all the snakes in our population.

Turtles/tortoise

Our team discussed the possibility of offering a dormancy for our tortoise species due to certain species bromating during colder months, however, through research and discussions with Zoo Atlanta's Assistant Curator of Herpetology the idea was tossed. Although dormancy is a natural behavior exhibited by gopher tortoises this behavior is much more complex than we originally hypothesized as it involves light cycle, temperatures, humidity, and diet regulations to list a few (Hill, personal communication, March 26, 2019). Although we have the ability to control the environment, their use in programming restricts true bromation from occurring and there is little study on the effects of bromating and not bromating tortoises in human care. Even though our tortoises do not bromate, they show signs of slowing down in the winter months. The goal behavior of exercise and nest/burrowing is offered once a month in the winter compared to weekly offerings during warmer months.

Lizards

For the lizards, due to each species having such different adaptations, we looked at each individual species to determine how often each behavior category would be offered. Basking, exercise, foraging and hides are offered with the same frequency for all lizards. As mentioned earlier with other reptile groups both basking and hides are always offered. Exercise, although offered in different ways for different species is offered once a week, as is foraging. Not the same for all lizards, but most, is grooming. Except for the prehensile-tailed skink (*Corucia zebrata*), grooming is offered once every other week and more so when that specific animal is shedding.

Bearded Dragon

Nesting/burrowing is excluded from the bearded dragon's (*Pogona vitticeps*) schedule as they are not particularly known for burrowing and we have also never seen our individual express this behavior when we have offered it in the past. For exercise, bearded dragons are active hunters (Australianmuseum.net, 2019) so he is provided weekly foraging but also exercise via running and climbing.

Blue-Tongue Skink

As a terrestrial lizard that, in the wild, would spend much of their time under the cover of grasses, leaf litter, burrows and other large objects (Australiazoo.com, 2019) nesting/burrowing is offered more often than it is to the other lizard species. Because of this the exercise offered to the blue-tongue skink (*Tiliqua scincoides*) is typically digging.

Prehensile-Tailed Skink

Perhaps with more variety than the other lizards are the prehensile-tailed skink. Living in a tropical environment (Reptilesmagazine.com, 2018) they require grooming via misting daily. During times of shed they are offered more variety of grooming options such as rough objects to rub against. They are not provided with nesting/burrowing as a goal behavior although they do live on mulch which provides humidity and burrowing opportunities. And finally, as arboreal lizards their exercise is elicited through providing climbing options.

Scheltopusik

Unlike many of the other lizards, the scheltopusik (*Pseudopus apodus*) has an increased frequency of nesting/burrowing. With no legs they spend their days on the ground and in burrows (pers. observation). Due to this his hide is also different than the other lizards as it is filled with dried moss as a permanent burrowing hide. In addition, the scheltopusik is offered an alternative nesting/burrowing option once a week. Normally his nesting/burrowing alternative is also paired with exercise via digging.

The benefit of our choices for how often to offer each category is that it can be changed based on the success for each species. We elicit these categories in a variety of different ways to enrich our animals' lives as best as possible. Table 1 displays the species, name, category, how often it is offered and how the goal behavior can be elicited through approved enrichment items.

To properly implement our goals, it was necessary to create a loose schedule for staff and interns to follow. First, a list of the daily behaviors to elicit (e.g. basking and hides) was created followed, by creating a monthly calendar for the others as applicable. Due to constant changes in staff scheduling, it was decided that keepers and interns would have an entire week to offer non-daily enrichment to each animal (Figure 1).

As each behavior is offered it will be crossed off the list, so others are aware of completion (Figure 2). This monthly calendar was created as a simple way to know which animals have and have not been enrichment for the week.

For daily documentation an additional sheet was created with everyone's name; keepers and interns would then fill out this form with the enrichment type, a yes or no to indicate the goal success and a column to explain how the behavior was offered/elicited. Figure 4 shows an example of how keepers and interns fill out the daily enrichment sign off. Figure 3 is the original form. At the end of the day a picture is taken of the completed daily form and is then uploaded to a folder for easy record keeping.

As mentioned previously it was important to allow flexibility when administering enrichment, therefore we do not require specific enrichment items or activities, instead we asked staff to offer the reptiles an opportunity to elicit a goal behavior through any approved item/activity. Many of the enrichment items/activities have been grandfathered in through Zoo Atlanta's approval process. While some are new and have been approved, others are still in the observation stage. If observed enrichment is successful it can then be used regularly for its goal behavior. Table 1 lists many, but not necessary all, examples of how to elicit each goal behavior per species. For example, foraging for carnivorous lizards' states that to elicit behavior live feeding is an acceptable form of enrichment. This can be administered in multiple ways such

as approved feeder toys, variety of food offered (crickets, super worms, etc), and offering live food in new locations. As you can see, if the enrichment is approved by Zoo Atlanta, there are multiple ways to elicit a behavior and, in some cases, enrichment can elicit multiple goal behaviors. Using the same example, a bearded dragon can receive both foraging and exercise through a live feeding. With a creative mind the possibilities are endless.

To make life easier for keepers, they are encouraged to offer scheduled enrichment while doing husbandry. Things such as basking, new hides and foraging are easy to offer as keepers clean and feed regularly. With daily tasks such as placing animals into window boxes (rotating habitats in view of public) the reptiles receive exercise just by keepers doing their normal daily tasks. Exercise for reptiles not suited for window boxes can become more of a challenge. Enriching a large gopher tortoise via floor time (giving animal access to kitchen floor) is not offered daily therefore it is the keepers' responsibility to remember to provide such animals with necessary enrichment. Our goal is the monthly calendar helps make remembering enrichment easier.

The ambassador team communicates with each other and speaks up if there is confusion, the evaluation process is ongoing; as we see issues, we fix them. Although small changes are made here and there as kinks are worked out, there are deeper levels of evaluation that need to take place. We intend to examine the success rate through reviewing the documentation of daily enrichment forms. We will not look at overall success but also look at what specific things were successful in terms of both enrichment goals and items/activities. If we find multiple successes with specific goals or items/activities, can and should we increase how often it is offered? If we find certain things were not successful how can we better elicit those goal behaviors? Do we need to decrease the frequency, find new ways to elicit those behaviors? Are we eliciting a different behavior other than the goal behavior? To answer these questions, we will look at the enrichment items/activities and the individual's health and motivation. We will also speak with staff and interns who are administering the enrichment to see what challenges they are having and what they find is working. While speaking with staff we will also look at and discuss goal behaviors that are consistently not offered and figure out why: staffing limitations, forgetfulness, time restraints, animals' motivation etc.

Re-adjustments will be made throughout every step, but they will be made based on results and keepers' input. As this is a newly introduced program that over the last three months, since its introduction, has been edited and tweaked in multiple minor ways, we do not anticipate making dramatic changes to the format of calendars. However, time will tell as will the arrival of new staff and interns who were not here when the program had its soft introduction. But most importantly the reptiles will dictate any further directions we take in re-adjusting our new enrichment program.

Currently staff response and understanding of the program is good. This new behavior-based enrichment program has opened the eyes of the animal care staff to encourage us to look at enrichment in a new light and understanding. By creating a flexible calendar and allowing staff to choose the specifics of administering enrichment we have created an easily understandable system that benefits both reptiles and staff. Now that we are looking at enrichment in a new way, it is easier to understand the needs of our reptiles and how simple things such as enriching through husbandry, scheduling enrichment, and knowing your species natural and individual history can improve the lives of overlooked species.

Tables & Figures.

Table 1			
Alligator	How often	Enrichment	How
	daily	Basking	bulbs, natural light
	1x wk	Exercise (digging, running, swimming)	window box, pool, dig box
	1x eow	Foraging	Toys
	Daily- replace 1x wk	Grooming	Rocks, wood
	daily-replace 1x wk	Hide	hides
	1x eow	Nesting/burrowing	Window Box, mulch
Snake	How often	Enrichment	How
	Daily	Basking	bulbs, natural light
	1x eow	*Exercise (climbing [RT Boa, B Python, juveniles], digging [RT boa, Indigo, Corn, Woma])	jungle gym, Plinco board, substrate, dig box, WB
	1x eow	Grooming	mist, substrates
	Daily- replace 1x wk	Hide	boxes, hides, perching
	1x wk	Nesting/Burrowing (RT Boa, Indigo, Corn, Woma)	substrate, newspaper
Turtles/ Tortoise	How often	Enrichment	How
	Daily	Basking	bulbs, natural light
	1x month	Dormancy	lights out
	1x wk. Winter: 1x month	Exercise (digging, running)	floortime, dig box, outdoor habitat, encounter
	1x eow	Foraging	Toys, hanging food, grass/hay
	1x eow	Grooming	mist, bath, substrates
	Daily- replace 1x wk	Hide	boxes, hides
	1x wk. Winter: 1x month	Nesting/burrowing	big box, mulch pile
Prehensile Tailed skink	How often	Enrichment	How
	Daily	Basking	bulbs, natural light
	1x wk	Exercise (Climbing)	Window box, jungle gym, training
	1x wk	Foraging	toys, hanging food
	Daily	Grooming	mist, substrates, rocks
	Daily- replace 1x wk	Hide	boxes, hides, perching
	NA	Nesting/Burrowing	NA
Scheltopusik	How often	Enrichment	How
	Daily	Basking	bulb, natural light
	1x wk	Exercise (digging)	floortime, dig box, Window box
	1x wk	Foraging	live feed
	1x eow	Grooming	mist, substrates
	Daily- replace 1x wk	Hide	boxes, hides, mulch
	1x wk	Nesting/Burrowing	substrate, newspaper
Bearded Dragon	How often	Enrichment	How
	Daily	Basking	bulb, natural light
	1x wk	Exercise (Climbing, Running)	floortime, Window box
	1x wk	Foraging	live feed
	1x eow	Grooming	mist, substrates
	Daily- replace 1x wk	Hide	boxes, hides
	NA	Nesting/Burrowing	NA
Blue Tongue Skink	How often	Enrichment	How
	Daily	Basking	bulb, natural light
	1x wk	Exercise (digging)	floortime, dig box, Window box
	1x wk	Foraging	live feed
	1x eow	Grooming	mist, substrates
	Daily- replace 1x wk	Hide	boxes, hides, mulch
	1x wk	Nesting/Burrowing	substrate, newspaper

Reptile Enrichment Calendar							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 1	Dormancy Turtle/Tortoise Exercise RT Boa	Exercise Alex Alligator Nest/Burrow Corn Snake Woma	Grooming Voldemort Bearded Dragon BT Skink Exercise Voldemort Thor Fina	Exercise Woma Indigo Carlos Little Foot Foraging Alligator	Foraging Turtle/Tortoise PT Skink Bearded Dragon Nest/Burrow Alligator BT Skink Voldemort	Nest/Burrow Turtle/Tortoise (No Winter) Foraging BT Skink	Exercise PT Skink Bearded Dragon Foraging Voldemort
Week 2	Exercise Ball Python Corn snake Thor (No Winter) Fina (No Winter) Foraging BT Skink	Exercise Alex (No Winter) Alligator Nest/Burrow RT Boa Indigo	Grooming Snakes Turtle/Tortoise Foraging Voldemort	Exercise Woma Carlos (No Winter) Little Foot (No Winter) Foraging Alligator	Foraging PT Skink Bearded Dragon Nest/Burrow Alligator BT Skink Voldemort	Nest/Burrow Turtle/Tortoise	Exercise Bearded Dragon Voldemort
Week 3	Exercise RT Boa Thor (No Winter) Fina (No Winter)	Exercise Alex (No Winter) Alligator Nest/Burrow Corn Snake Woma	Grooming Voldemort Bearded Dragon BT Skink Exercise Voldemort	Exercise Indigo Carlos (No Winter) Little Foot (No Winter) Foraging Alligator	Foraging Turtles/Tortoise PT Skink Bearded Dragon Nest/Burrow BT Skink Voldemort	Nest/Burrow Turtle/Tortoise (No Winter) Foraging BT Skink	Exercise Bearded Dragon Foraging Voldemort
Week 4	Exercise Ball Python Corn snake Thor (No Winter) Fina (No Winter) Foraging BT Skink	Exercise Alex (No Winter) Alligator Nest/Burrow RT Boa Indigo	Grooming Snakes Turtle/Tortoise Foraging Voldemort	Exercise Woma Carlos (No Winter) Little Foot (No Winter)	Foraging PT Skink Bearded Dragon Nest/Burrow Alligator BT Skink Voldemort	Nest/Burrow Turtle/Tortoise (No Winter)	Exercise Bearded Dragon Voldemort
Week 5	Exercise Thor (No Winter) Fina (No Winter)	Exercise Alex (No Winter) Alligator	Exercise Voldemort	Exercise Carlos (No Winter) Little Foot (No Winter)	Foraging PT Skink Bearded Dragon Nest/Burrow BT Skink Voldemort	Nest/Burrow Turtle/Tortoise (No Winter) Foraging BT Skink	Exercise Bearded Dragon Foraging Voldemort

Figure 1

Herp/Invert Enrichment Calendar							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Week 1	Dormancy ~~Turtle/Tortoise~~ Exercise ~~RT Boa~~	Exercise Cockroach Tarantula Alex Alligator Nest/Burrow Corn Snake Woma	Grooming Voldemort Bearded Dragon BT Skink Exercise ~~Voldemort~~ Thor Fina	Exercise ~~Indigo~~ Carlos ~~Little Foot~~ Foraging Alligator	Foraging Salamander Turtle/Tortoise PT Skink Bearded Dragon Nest/Burrow ~~BT Skink~~ ~~Voldemort~~	Nest/Burrow Turtle/Tortoise (No Winter) Foraging BT Skink	Exercise ~~Bearded Dragon~~ ~~Voldemort~~ Foraging Voldemort
Week 2	Exercise ~~RT Boa~~ ~~Corn Snake~~ Thor (No Winter) Fina (No Winter) Foraging ~~RT Boa~~	Exercise Salamander Alex (No Winter) ~~Alligator~~ Nest/Burrow ~~RT Boa~~ ~~Indigo~~	Grooming Snakes ~~Turtle/Tortoise~~ Foraging ~~Voldemort~~	Exercise ~~Woma~~ Carlos (No Winter) Little Foot (No Winter)	Foraging PT Skink Bearded Dragon Nest/Burrow ~~Alligator~~ ~~BT Skink~~ ~~Voldemort~~	Nest/Burrow ~~Turtle/Tortoise~~	Exercise ~~Bearded Dragon~~ ~~Voldemort~~
Week 3	Exercise ~~RT Boa~~ Thor (No Winter) Fina (No Winter)	Exercise ~~Cockroach~~ Tarantula Alex (No Winter) Alligator Nest/Burrow ~~RT Boa~~ ~~Woma~~	Grooming ~~Indigo~~ ~~Carlos~~ ~~Little Foot~~ Exercise ~~Voldemort~~	Exercise ~~Indigo~~ Carlos (No Winter) Little Foot (No Winter) Foraging ~~Alligator~~	Foraging ~~Turtle/Tortoise~~ PT Skink ~~Bearded Dragon~~ Nest/Burrow ~~BT Skink~~ ~~Voldemort~~	Nest/Burrow Turtle/Tortoise (No Winter) Foraging ~~BT Skink~~	Exercise ~~Bearded Dragon~~ Foraging Voldemort
Week 4	Exercise ~~RT Boa~~ ~~Corn Snake~~ Thor (No Winter) Fina (No Winter) Foraging BT Skink	Exercise Salamander Alex (No Winter) Alligator Nest/Burrow ~~RT Boa~~ ~~Indigo~~	Grooming ~~Indigo~~ ~~Turtle/Tortoise~~ Foraging ~~Voldemort~~	Exercise ~~Indigo~~ Carlos (No Winter) Little Foot (No Winter)	Foraging ~~PT Skink~~ Bearded Dragon Nest/Burrow ~~Alligator~~ ~~BT Skink~~ ~~Voldemort~~	Nest/Burrow Turtle/Tortoise (No Winter)	Exercise ~~Bearded Dragon~~ Voldemort
Week 5	Exercise Thor (No Winter) Fina (No Winter)	Exercise Alex (No Winter) Alligator	Exercise Voldemort	Exercise Carlos (No Winter) Little Foot (No Winter)	Foraging PT Skink Bearded Dragon Nest/Burrow BT Skink Voldemort	Nest/Burrow Turtle/Tortoise (No Winter) Foraging BT Skink	Exercise Bearded Dragon Foraging Voldemort

Figure 2

Carlos			
Little Foot			
Cockroaches			
Sparkle Muffin			
Tony			
Alligators			
Chakana			
Ed			
Kipria			
Nyoka			
Adahy			
Cooper			
Ramsay			
Nonda			
Solomon			
Viserion			
Reggie			
Voldemort			
Alex			

Figure 3

2/13

Name	Enrichment Type	Success?	How?
Carlos	G	Y	mist
Little Foot	G	Y	mist
Cockroaches			
Sparkle Muffin			
Tony			
Alligators			
Chakana	G	Y	mist
Ed	E, NB, G	Y, N, N	VB, mulch, mist
Kipria	G	Y	mist
Nyoka	G	N	mist
Adahy	G	N	mist
Cooper	G	Y	mist
Ramsay	G	Y	mist
Nonda			
Solomon			
Viserion	E, G	Y, Y	VB, mist
Reggie	E, NB, G	Y, N, Y	VB, mulch, mist
Voldemort	F	Y	crickets
Alex			

Figure 4

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Back to Basics, Isn't Basic

Pieter Giljam

Kolmårdens Wildlife Park was established in 1965, the Zoo quickly became the largest zoo with in the Nordic countries. The Zoo has over 600 individuals and is 300+ acres in size. In 2014 the zoo started to look at how they handle their animals and the impact on their welfare. It wasn't until 2015 that we started to change the animal handling throughout the whole zoo.

Over time the changes were slowly spreading throughout the zoo. We applied basic techniques to enhance the animal's choices, such as operant conditioning with the emphases on positive reinforcement. Our goal is to have our animals comfortable with us and participate in their daily care. These strategies and training programmes will not only help the welfare but also the efficiency of the keepers.

We looked at the different daily tasks of the zookeepers and tried to find out how we can save time in their day. Many of the teams have a challenging animal to keeper ratio, this is often the reason cited as to why they are not able to train their animals. At Kolmårdens Wildlife Park we try to help the keepers to discover how we can overcome those challenges, and discuss options so the keepers are able to train the animals and fulfill their daily tasks.

An example of where we managed to save time is with our 21 Chimpanzees. One of the behaviours that has saved us the most time is a call over. The signal for the call over is a long whistle sound, the animals' response is to come to the keepers, regardless of where the signal comes from. We also conditioned them to an emergency recall, a very important and useful behaviour. The signal for the emergency recall is three 2 second blasts of a soccer whistle. We have conditioned it so that when they hear that sound, it tells the animal 'Stop whatever you are doing, and go to the backstage areas'. The video can be seen on our Zoospensefull YouTube channel. When managing 21 chimpanzees, the keeper animal ratio is a big challenge, especially to reach an individual chimpanzee for a 1 on 1 training session. One of the points I often discuss is when working with groups of animals being able to gate or separate the animals allows for more focused training sessions. After many discussions with the chimp team, we decided to train a new behaviour. The signal, a 3 second blast on the soccer whistle tells the 21 chimpanzees to separate themselves in sub groups. All the chimps have decided their own groups and this has been the same for the last 2 years. We have saved a lot of time since developing our training programme.

Often, we ask questions when developing a new training programme to tackle any issues we might be facing here at the zoo. We ask, how can we get animals to come quicker, how can we reach them individually for a training session and how do we separate animals when we don't have many keepers? A major aspect we need to consider when developing these plans, is to think about the social groupings. We think about which animal has what position in the group? How can we maintain the group as it is? Working with a high animal to keeper ratio we are obliged to have multiple animals worked by one trainer. To make sessions like this successful, we have to understand an individuals place in the hierarchy, especially dominant animals. Once we have determined a dominant's place, we can teach the animal that if they allow the others to eat, they will get increased or preferred reinforcement. This allows the animals to cooperatively work together within the training session and you will have calmer animals. This technique is called cooperative feeding and is never really a finished behaviour. The reason is that changes happen all the time in a group and we have to be aware of this, a hard task for the keepers but very important.

Safety is one of the main priorities for our zookeepers. With having animals in big exhibits where we are not able to work in a protective contact scenario, we have to think about safety directly. For example at the Alpine Ibex exhibit, we have to think about the large horns of the animals and the potential health and safety risks. So what do you do? We still want them to come to us when asked, but we teach them that they have to stay at a distance of 2 meters away from us. This allows us to work safely with them.

We also constructed special boxes that put the animals in a type of semi-protected contact. In the boxes the ibex can come closer to the keepers. The boxes are made from wooden pallets and have a triangle in the front. This triangle protects us from the horns.

Kolmårdens Wildlife Park is trying to empower the animals through positive reinforcement. We want the animal to understand in order to get something you need to do something. The focus is always that our programme should have a welfare benefit to the animals we care for.

An Eagle in The Closet, A Bobcat in The Bathroom And a Weasel in The Toilet: Our Evacuation Story From The Carr Fire

Sharon Clay

Curator of Animal Programs

Planning for the worst is what emergency plans are all about. For over 25 years I have looked at the words on paper, “evacuation locations”, “emergency numbers”, “checklist”. Month after month we rotate food and supplies in the emergency kits. We practice the plan and it all seems like a waste of time. Never did I think we would have to carry one out. Never did I think our safe evacuation sites wouldn’t be available and never did I think it would last so long. On that fateful day of July 26, 2018 as the Carr Fire was bearing down on our City, we had to do just that.

This paper will take you through the adventure of evacuating 87 animals from our facility and the two month journey that followed. How we did it, what worked well and what we learned. We will show how we turned a 2100 square foot house into a makeshift facility for almost two months and continued to provide excellent care for all the animals.

The Carr Fire:

My birthday is my favorite day of the year. No matter how old I get, I still celebrate like I am fifteen! This year was no exception. A group of us were out celebrating at an Escape Room. While we searched for clues indoors, we had no idea what was happening outside. The power had gone out at the Escape room and we were forced to take the party to my house. We had just arrived at my house and stepped inside when I got a call from Carrian Foster, our Guest Experience Officer, who had made a stop on her way over to us. All I heard was “Get to Turtle Bay now, get the animals out now. Hurry!” Carrian was standing on the Sundial Bridge watching the flames coming towards her. There was no way to tell if the fire was ten miles or ten blocks away, or how fast it was moving.

We all jumped back into our cars and rushed to the Park to start our evacuation protocols. We had done drills, we knew where all the supplies were and how many vehicles we would need, but looking back now it is so unreal. We were confident about most of the animals kenneling without issue, but the bobcat would be a challenge. We started with her while trying to be as calm and normal as possible. Sure enough though, she didn’t kennel right away.

As we were running around packing up the other animals, I couldn’t believe how well all of the other mammals kenneled when we asked. With our adrenaline pumping, they surely felt that something was wrong. A few hesitated, but it was going well. The staff communication was extraordinary. We all knew where the other was and the status of each animal and location. As the time clicked by, we got phone updates from Carrian who was watching the fire and letting us know our safe time. “Hurry, you guys need to finish up!” was one of the calls she made. The areas including Wildlife Woods and the Mill Building were clear except for Seteweela, the Golden eagle.

We had several non-animal care staff assisting and we were doling out jobs as we continued to pack up. It was a good thing too, because during the middle of gathering up animals, we get the call that three of the trainers have to leave and go evacuate their own homes. After they left, the rest of us kept going.

Garrett Moore, our Aquatic Keeper, and my husband, Wayne, were working together to pack up the Museum building’s animals and I headed over to help them get Timber, the beaver, and the Buffle-

head duck, who would not kennel. Trying to stay as "routine" as possible so that Timber would get out of the water was like asking a fish to walk on land! Despite the circumstances, we did it. We all sat down on the concrete as calmly and quietly as possible and just waited for him to come out to sit on our laps. It felt like an hour, but was probably two minutes.

Once we had all the Museum's animals, we headed back to the Forest Camp. Ash was falling on us like a light snow and burned paper landed on the ground. All the animals were kenneled and ready to go except for the lorikeets. There were still about a dozen who we were unable to get into kennels. "You guys have to finish," insisted Carrian. "We are almost done", I reassured her, but honestly was terrified we would have to leave some behind to burn. It was at that moment that we were so determined that we just started grabbing lorikeets out of the air! I would swing a net to scare them and they would fly right into Garrett's hands! One after the other we tossed them into kennels. The only two left were the large Black-cap lorikeets. They were out in the main area. We walked around to find them in the dark and found one in the upper corner, too high for any normal person to reach. Thankfully we had Garrett! He slowly approached and then... BAM, he grabbed the bird off the perch! "Ouch, ouch, ouch," I hear as the bird is latched onto Garrett's hand. We quickly help him, get the bird in the kennel, and repeat with the very last bird!

We rushed the last cages to the vehicles, and I ran around the kitchen grabbing some last-minute items. As I closed the door to the Mill Building kitchen I took a deep breath, said, "Goodbye, I hope to see you again," and locked the door.

I think I was in shock as I drove down the road as my phone rang and it was Mike Warren, my boss, and CEO of Turtle Bay. "How are you"? he asked. As I broke down and cried I repeated over and over, "We got all the animals out, we got them all out!" A caravan of eight vehicles drove out of Turtle Bay with 87 animals.

I didn't know where to go. Was the fire just going to blow across the entire City? It was 10:30 at night and the pre-arranged places we had to help with evacuations were also evacuating. First stop would be my house as I live on the far East side of town and the fires were on the West. As we all pulled up to my house and got out we just stood in the driveway wondering what was next. Everyone was looking to me to say what to do, but in 30 years of working with animals, this was the first time I had no reference point. I had no idea at all, but I had to make a decision. We all bounced thoughts around and decided that we were far enough away to make it to morning so we would just bring all the animals into the house and figure out the rest later. My neighbors all saw us pull up and came to the house to give their support. Staff had to leave to go check on their own lives, "What if we have to evacuate again?", "I can't get them all out." All of my neighbors said, "We've got your back. If our neighborhood has to go, we will get the animals out!"

The support during this whole ordeal was mind boggling. I reached out on a Facebook zoo page, asking if any facilities in Northern California could house our animals in the event we needed to leave again. The response was inspiring. We proceeded to unload all 87 animals into my house. Placement was important so animals would feel safe. "Put the eagle in the walk-in closet," I directed, "It will be quiet in there for her." "The foxes can go into the master bathroom, the weasel in the toilet room, and use the hallway closet door to make a safe space for Nashi," (our raccoon). "Stack the reptiles in the hallway and make sure Ned gets some privacy," were some of the directions as people paraded into the house, kennel after kennel. "What about all the lorikeets?" someone asked. "Just line them up in the garage," I responded.

We set up one of my trainers in a spare bedroom with her dog and cat, as she had personally been evacuated. It was now 1:00 am, everyone else had gone home and many of the mammals stress soiled their kennels and needed to be cleaned so that they didn't have to sit in their own filth. We had only one extra kennel. The two of us spent the next hour and a half cleaning kennels. We switched the fox into the extra kennel, cleaned his and switched back. Then the other fox, raccoon, badger and so on until every one of them had a clean place to sleep. Just as we thought we were done, Adrienne John, our Assistant Curator of Animal Programs, texts me, "We are evacuating, we are on our way over." We set up the other spare bedroom. At 3:00 am Adrienne, her husband, her two dogs, three cats and seven reptiles joined our make shift zoo.

That first day was quite a challenge. Staff arrived at 6am. It took all day to clean, feed and exercise

all the animals but as the days went on, we started getting a new routine. By day three I think we had it pretty much figured out. The staff were working staggered shifts so that we had someone here with me from 7:00 am to 11:00 pm every day. Commissary was set up in the kitchen and one trainer was in charge of getting diets ready. Other staff were shifting the animals to clean kennels, weigh animals, and feed out morning diets. We had several of our volunteers here to wash kennels on the back patio, which was an all-day affair.

The afternoons were for exercise. It really was quite the sight as we had to get creative to get all the animals out for exercise. We barricaded the laundry room to make a play area for Sweet Pea, the skunk, and when she wasn't there, it became a safe place for the birds to get out and stretch. The spare bathroom was also a great place for the birds. Ned, the Black vulture, really made himself at home as he would fly up to the shower door and spread his wings for hours! Our fenced in backyard was perfect for the mammals to explore. One at a time we would let them out. Nashi, the raccoon, loved the hose bib while the Digger, the badger, dug in the pile of soil we had brought in for him. Timber however required 2-3 times a day to come out and wander the backyard and go for a swim in the kiddie pool, including one trip out at 6:00 am and one at 11:00 pm.

Lorikeets were kept in the garage. It was a circus trying to figure out which birds could stay together in the cages that we had, without killing each other. Thankfully, we had received so much support from other facilities. Sacramento Zoo provided us with several kennels and bird cages for the Lorikeets, making three separate two and a half hour trips up to deliver supplies. Safari West brought up supplies and enrichment for both staff and animals

By day four we knew we were safe at Turtle Bay from the fires, but the smoky air quality was another story. We couldn't bring back any outside animals until the air quality improved. As we all know, smoke can be pretty deadly itself. The Mill Building had so many cracks and crevices that the air was almost as bad in there as outside. On day ten the air quality had improved enough to put some of the mammals back out. It was at this point we slowly brought animals back to Turtle Bay. Then, we packed all the doors and cracks with towels, plugged in an air purifier and got the Mill Building set for most of the birds.

Throughout the first week we struggled with whether or not we made the right decision to stay put at the house. Sacramento Zoo was fully prepared to house our entire collection if need be. We decided that, because our animals are all trained animal ambassadors with close relationships with trainers, they would be more comfortable in small kennels with the people they knew rather than in a proper holding facility with strangers. We worried that the stress from the ordeal would cause strain on our relationships, but found this was the opposite as our bonds grew even stronger with our animals.

There were some animals we considered moving to the zoo. The Golden Eagle was our one untrained animal, and staff were unable to do more than switch her between kennels. For her, we ended up creating a make-shift holding in an old display by boarding up the front and using air purifiers to keep the air clean for her. The fire was out, but the lorikeets were still at the house because of the air quality. Being in small cages for seven weeks, we struggled with wondering if they would be more comfortable in the larger holding that Sacramento Zoo could provide. Fortunately we were finally able to get the air in their off display holding at Turtle Bay clean enough that they could go back.

Smoke was a big issue, any time the air quality index, or AQI, was over 300 the animals needed to come inside. For two months the air quality would go up over 300 and back down to 95 like a rollercoaster ride that just wouldn't end. Staff would come in at 4:00 am to get animals out of the smoke, and none of us had slept well for weeks.

We learned a lot from this experience, and there are some things we would have done differently: First, remember to leave the lights out so you don't scare the birds; second, the people helping you may not be the people you trained with; lastly, evacuation sites may not be available, so have a back-up for your back-up plan.

Evacuation drills and capture techniques were all things I never thought I would have to use. I can't help but think that it is all of my years working with animals that brought me to this point where I had to use all the skills I had learned and all the trainings I have done. I will tell you one thing for sure, this is one Birth-

day I will never forget!

I would like to thank the animal care staff for their dedication, flexibility and unwavering support during this challenging time:

Adrienne John- Assistant Curator of Animal Programs

Tory Baller- Animal Trainer

Rachel Skrobot- Animal Trainer

Miranda Cays- Animal Trainer

Garrett Moore- Aquatic Keeper

Jonelle Meyer- Animal Trainer

Kyla Forester- Lorikeet Keeper

Other Turtle Bay Staff:

Carrian Foster- Guest Experience Officer

Melissa Maney- Guest Services Lead)

Liz Crain- Development & Membership Coordinator)

Joanne Crosetti- Development Officer)

CEO Mike Warren and his wife, Linda

The following, for their support and supplies:

Sacramento Zoo

Safari West

Entire professional zoo industry

Petco

PetSmart

Turtle Bay Volunteers

Take Better Care of Animals By Taking Care of Yourself

PJ Beaven

ZooFit

Working with animals is a dream come true for many of us. We spend years studying and learning all we can to ensure we can give creatures in our care the best life. But do we consider how we take care of ourselves into the equation? PJ Beaven was a zookeeper who loved her animals, and wanted to do more. Her ah-ha moment came when she realized she couldn't give great care to her animals if she didn't take basic care of herself. PJ went on to develop a fitness program utilizing the principles of an animal care specialist. Using positive reinforcement training methods, enrichment, and even conservation, PJ lost 50 pounds but gained so much more. Learn how to break healthy habits into small, achievable steps makes lifelong behavior change to improve our own well-being. Incorporate enrichment to make working out fun and exciting. And make a difference by connecting healthy habits to conservation efforts. Whether you want to lose weight, pick up the extra-large boomer ball, or increase your energy, PJ's revolutionary fitness program will help you be the best version of yourself you can be. Improve your fitness and give better care to the animals.

In 2014, I was a zookeeper at Woodland Park Zoo in Seattle. Working with elephants was a dream come true. But it was wreaking havoc on my body, and to a degree, on my mind. My knees hurt, my back hurt, and I just didn't have the energy to do tasks where I used to excel- enrichment or patience in training sessions. All that changed when I decided to implement a fitness and wellness program based on my favorite practices as an animal keeper. Because, how could I take great care of elephants if I wasn't taking basic care of myself?

The principles of Operant Conditioning, Enrichment, and Conservation became my pillars for a program I call ZooFit. With these practices, I made fitness a positive experience, I made it fun, and I made a difference in conservation efforts.

The importance of a fitness and wellness program for animal professionals is not a vanity issue. It is at its core an animal welfare issue, as well as a safety and wellness issue. Improving our sleep, increasing energy, reducing stress, and gaining mental focus are just a small sample of the benefits to implementing a fitness program. For animal professionals, fitness means doing our jobs easier, safer, and reaping other benefits. Exercise is considered the most important factor in preventing job related injuries. And for injuries we can't avoid, having a fitness program in place will help you bounce back easier and faster. The ZooFit program keeps you moving and developing healthy habits through its three main pillars- Fitness Through Operant Conditioning- creating habits through successive approximation and positive reinforcement, Enrichment- making fitness functional, fun, and engaging, and Conservation- connecting to the earth in a healthy way and seeing how our healthy habits can have a positive impact on the planet.

Even though many animal professionals have a strong understanding and background in training, it's a fun eye-opening experience to see how these principles can be applied to our own health and wellness.

Fitness Through Operant Conditioning

Operant conditioning is the learning philosophy which states behavior is learned through the association of

the consequences which follow (Pryor, 1985). For every action, there is a consequence which will increase or decrease the likelihood of the behavior occurring again. Reinforcement increases the likelihood, punishment decreases it. Shaping, a method of operant conditioning where behavior is broken down into smaller steps is also an important lesson for those starting a fitness program.

By applying these principles of learning through operant conditioning and shaping, we can develop life-changing healthy habits by breaking them into smaller steps and using positive reinforcement to maintain these healthy habits and achieve our fitness goals. Not only are healthy habits more fun to develop, but they become long-term lifestyle changes rather than temporary quick fixes.

ABC's of Training

I love the ABC's because it really is the basics of training. A= Antecedent, the signal or cue to start a behavior. B= behavior, and C= consequence. Using the ABCs of shaping, we can quickly learn healthy new habits. Say you want to create a habit of drinking more water. For the antecedent, set an alarm on your phone or watch, or put post-it notes around locations you frequent. When your alarm goes off, drink a glass of water. The completed behavior earns a positive reinforcement consequence. This can be a simple pat on the back, a check mark in your journal or fitness tracker, or giving yourself a positive affirmation.

In Angela Duckworth's book *Grit* (2016), she shows how positive self-talk boosts confidence and improves performance in behavior. Based on her research, all you need to improve the likelihood of continuing drinking water is a positive affirmation, such as giving yourself a high-five, or saying out loud "woo-hoo, I'm awesome".

Positive Reinforcement Vs Punishment

There is a consensus among animal behaviorists about which consequence is most effective. It is profoundly easier to teach an animal what you want them to do than to teach them by way of showing them all the behaviors you DON'T want. For this reason alone, reinforcement is encouraged and recommended when learning new behavior. However, it isn't just reinforcement, it's specifically positive reinforcement which is touted as best. Why is that?

Positive reinforcement is the receiving of something desired in response to a behavior, increasing the likelihood of that behavior occurring (Pryor, 1985). With negative reinforcement, the learner avoids a punishment, or an undesirable consequence by performing the behavior. Avoiding punishment is an incredibly strong motivator in the moment. Think of a lion chasing a gazelle. The gazelle is highly motivated to run fast, but not for a long period of time. The gazelle will only run fast as long as it is threatened by a lion. No more, no less.

There is a significant difference between positive and negative reinforcement in a fitness setting. How would you feel if you worked hard to achieve your goals, whether it's running a marathon, losing weight, or lifting a certain weight (say a giant boomer ball unassisted), you finally get there, and nothing happens? No one congratulates you. You get nothing in return. If you don't meet your goal, even if it is by a small margin, you are punished. You wanted to lose five pounds, but you only lost 4.5. With negative reinforcement and punishment, those 4.5 pounds don't matter. The only thing that does matter is the .5 pounds you didn't lose. How motivating would that be?

People practicing a fitness program are notorious for using punishment. We berate ourselves for not doing what we set out to do, guilt ourselves into doing what we think we "should" be doing. We have even been known to *withhold food*. If we wouldn't do it with our animals, why do it to yourself?

On the opposite side of operant conditioning we have positive reinforcement. How motivating is it to have every success, every step of your journey recognized, celebrated, and reinforced? If you don't quite hit your goal, nothing bad happens. In fact, nothing happens at all. You only focus on your accomplishments. Positive reinforcement is the best way to approach our fitness using operant conditioning? But how do we go about doing that?

Setting Yourself Up For Success

My first suggestion is a basic for animal training. It's how we have successful training sessions BEFORE we start the training session. We set the animal (and ourselves) up for success. We remove all distractions before the training begins. Rarely will there be a feeder puzzle, a bunch of toys, or other animals roaming around randomly during our training sessions (it happens, but it's rare, and we notice how distracting the other factors are to the animals). We can do the same thing for our fitness. Set yourself up for success. Set aside your exercise time, and turn off your ringer, or set alerts to silent, or off during your workout time. If you have trouble getting out the door to head to the gym on time, set yourself up for success by preparing your gym bag the night before. Place it right by the front door so it's easily accessible, and then grab it and go. You can make breakfast easier, too, by preparing overnight oats, or a casserole the night before. By having meals which can be quickly heated up in the morning on hand, you save time in the morning, and start your day off right.

Behavior Momentum

Getting started with fitness can be tricky, but so can training an animal. Using behavior momentum works great in both situations. Basically, behavior momentum is starting easy and small and building up to larger and more complex. This is slightly different than shaping, in that it usually occurs within one session, rather than a series of several learning/training sessions.

Using behavior momentum in your fitness can save you from injuring yourself, help motivate you to keep going, and help you work within your limits. Fitness professionals call it a "warm-up". Perhaps you've heard of it. Practice it.

In weight training, you want to practice several repetitions at a significantly lower weight before going for a new personal record. This build-up of weight does several things. It warms your joints and muscles, preparing them for your activity. It also pumps you up. If you could lift 50 pounds, you can try 60. Each success builds momentum to continue going.

You can even trick yourself into working out by practicing behavior momentum. "I'm only going to walk for 5 minutes", but by minute 4, you are enjoying the scenery, or you want to make it to the end of the road, or a slew of other motivators can help you to keep going. Let the momentum take you where you need to go.

Motivation in the Bank

Putting trust in the bank is the idea inspired from Steve Martin (2014) which promotes every positive interaction we have with our animals is like depositing trust in the bank. When we really need it, we can withdraw that trust without destroying our relationship. We can do the same with our fitness, but instead of trust in the bank, we are depositing motivation. Every time you complete a workout, eat a healthy snack or meal, or progress in developing a healthy habit is putting a little more motivation to continue on. On days you are tempted to eat unhealthily, or skip a workout, you can withdraw some of that motivation without killing your willpower. If you have a run of working out 5 days a week for over three months, notwithstanding extraordinary circumstances, how willing would you be to skip a workout? Such a winning streak is hard to ignore or give up.

Jackpots

I can't reiterate this enough- positive reinforcement is not a burger after the gym. But it doesn't have to be just hi-fiving yourself every time you make progress either. If you want to use eating a grand meal at your favorite restaurant as a reward, go for it. But make it motivating and reinforcing, not the endgame. Let the meal be a celebration of your accomplishments and a bolster to continue on your journey. There are dozens of ways to reinforce your healthy habits without negating the hard work you have done by eating junk

food or overindulging. From iTunes and Netflix binges, to massages and planning a vacation, make sure your reinforcement is appropriate for your behavior.

Differential Reinforcement of Other/Incompatible Behavior

I learned about Differential Reinforcements from Ken Ramirez's book on Animal Training. DRI/DRO are great ways to extinguish undesired behaviors in our animals. An animal can't lunge at your food bucket if they are laying down. It's difficult for them to steal another animal's food when they are hugging a tree. Using DRO/DRI is a fantastic way to break bad habits. Instead of punishing yourself for doing habits you wish to stop, implement an alternative behavior.

I quit smoking by replacing the cravings to smoke with an incompatible behavior- cooking. Whenever I had a craving, I grabbed a cookbook and tried something new. The end result was I got really good in the kitchen, and my cravings completely went away. Making these types of substitutions can help create healthy habits while eliminating the bad ones.

LRS- Least Reinforcing Scenario/Stimulus

When an animal performs a behavior incorrectly, trainers have found a more effective way of communicating with the animal than with punishment. An LRS, or least reinforcing scenario is not an ignore. We don't ignore our animals, especially when we are working with them. This is for our safety, and the well-being of our relationship. When trainers use an LRS, they acknowledge the animal by looking at them, in a neutral stance. The trainer is neither reinforcing nor punishing. By giving an LRS, the trainer effectively tells the animal "what you just did there will not get you reinforcement."

I believe you should not ignore setbacks or negative behavior in your fitness either. Take every opportunity to learn from every scenario. Did you cave into temptation and grab a donut in the breakroom? Acknowledging it is the first step to preventing it from happening again. Did you skip a snack or meal before going to the breakroom? Is there a way you can avoid going into the breakroom, or at least make it fast so you don't linger and tempt yourself further? There is a huge difference between acknowledging and learning from your mistakes, and beating yourself up for making one. A slip is not going to topple all the progress you have made, in fact, a slip will make you stronger in the future as long as you learn from it.

Going Back to Kindergarten

Going back to kindergarten is a great method for dealing with plateaus. In a way it's a little like behavior momentum, but rather than an in-the-moment tool to use, this practice goes back several steps in the training plan and starts over. The idea is when an animal is stuck, they are learning differently than we thought we could teach it. So, by going back a few steps to where the animal was succeeding, we can go about training and teaching in a different way.

If you are struggling with a certain aspect of your fitness, go back to the point you were successful. Perhaps you were doing great going to the gym 3 days a week, but increasing it to 4 proved to be a struggle. Go back to 3 days a week, and re-evaluate your plan. Perhaps you can't make it the 4th day because your work schedule is wonky. Use the time you are back in your success zone to find another way to get a 4th day in. Perhaps instead of going to the gym, you can hit the trail for a run. Maybe you need to do a workout from home one day a week. Or this maybe just a temporary problem which you can use behavior momentum to overcome, just stay at 3 days for a little longer.

Don't let a snag prevent you from your progress. Even if you are back in kindergarten for a long time, you are still doing a great job, better than when you first started.

Lowering Criteria

Another way to deal with a plateau, or challenging situation, is to lower the criteria. After an animal performs well for a veterinary examination, trainers often lower the criteria for a short time, to establish more

trust in the bank, and build up momentum again with the behavior they might associate with a negative event.

Traveling is a perfect example of a time you may need to incorporate lowering criteria in your fitness. You may have full intentions of getting a full workout while you are away, either on vacation or for business. But you may not have realized there wasn't a gym, or that they wouldn't have the equipment you need. Perhaps after sitting all day, listening to paper presentations, you weren't prepared to be exhausted. Instead of falling off the wagon and not doing anything, simply lower your criteria. If you normally workout five days a week, bring it down a little and let yourself go with 3 days of working out. If you are following a strict caloric diet, but know you are going to be eating out every night, give yourself a little wiggle room, rather than berate yourself and starve yourself during what is supposed to be an enjoyable trip.

Conservation

Conservation fitness is my favorite part of ZooFit. What we eat, and how we move matters. Fitness is the way we bridge our conservation efforts with success. Want to help orangutans and elephants in Asia? Eat healthy and avoid processed foods with conflict palm oil in them, and not only will you make a difference to Asian wildlife, you will have a healthier diet, and that will definitely help you achieve your fitness goals. At this point, it's no longer JUST about saving endangered animals. You see the results of eating healthy, the conservation action associated with it just reinforces you to continue eating right and avoiding processed foods. Saving animals becomes your outside source of willpower. It helps resisting tempting treats when it's not just about you (we can always justify a donut, am I right?). Saying no to foods with palm oil in them is a statement towards your commitment to conservation.

This connection can be made for a variety of healthy habits. Cut down on your carbon footprint by bicycling to work, or at the very least, errands which are close to home. Save polar bears, and well, every other animal on the planet affected by climate change, and improve your cardiovascular health. Walking can do the same thing. Your activity is reinforced not only by your improved health, but the idea you are doing something significant to help the planet. Cut out unhealthy fast food when you practice meal prepping, and you get to help save forests from deforestation, and reduce single use plastics. It's a win-win-win, because you end up saving money by avoiding fast food, you eat better and feel better, and you make the world a little better, too.

ZooFit is about changing our mentality on fitness. Instead of "we have to", we change our mindset to "I get to". We get to make a difference in our world by taking care of ourselves. We work toward being better zookeepers, trainers, and animal professionals by practicing what we preach, and becoming the best versions of ourselves. Show the world it's not only possible to train animals amazing behaviors, but teach ourselves to achieve whatever we put our minds to as well.

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Conservation Intent to Conservation Action: Maximizing Animal Ambassador Programs for Meaningful Environmental Impact

Nicolette Canzoneri, MSc
Action Research & EnvARK Innovators

Many zoos and aquariums strive to positively impact conservation-related behaviors of their guests and typically target guest behavior through educational programming. Recent animal rights pressures have examined not only general zoo animal welfare, but also animal ambassador programs specifically, with the argument that the benefits do not outweigh the costs. It has thus become imperative to utilize best practices when developing, implementing, and evaluating animal programming to ensure that true and meaningful impacts are provided for our communities, ecosystems, and ultimately the animal ambassadors' wild counterparts. My research has identified potential gaps within these processes that can be filled through institutional and industry collaboration to create the most effective programs that target conservation action. This paper discusses the theoretical and practical aspects of utilizing behavioral science in program development and the three main hurdles industry professionals struggle with when targeting behavior. As zoos and aquariums continue to evolve as centers for conservation education and inspiration, it is important to develop programming that accurately reflects this purpose. This paper intends to inform practitioners on current research-based tactics for targeting conservation action and how these tactics can be adopted within their institutions to meaningfully effect change. Zoo and aquarium practitioners are uniquely positioned within our communities to understand and appropriately apply behavior management techniques with guests as a result of their behavioral knowledge and dedication to conservation. With intentional evolution and continued refinement, our industry can have an incredibly powerful impact on the future of all wildlife.

Many zoos and aquariums strive to positively impact the conservation-related behaviors of their guests and typically target guest behavior through educational programming. Recent animal rights pressures have examined not only general zoo animal welfare, but also animal ambassador programs specifically, with the argument that the benefits do not outweigh the costs. It has thus become imperative to utilize best practices when developing, implementing, and evaluating animal programming to ensure that true and meaningful impacts are provided for our communities, ecosystems, and ultimately the animal ambassadors' wild counterparts.

My research illuminated areas within animal ambassador program development, implementation, and evaluation that could be improved to effectively target pro-environmental behavior change. Among the AZA accredited facilities that participated in my study, there was a general "theory of action" (i.e., underlying components needed to produce a specific outcome) regarding how behavior is impacted. The theory of action is simply that education coupled with animal experiences leads to behavior change. This finding is not necessarily surprising, but it does illuminate a faulty assumption that can be rectified to improve programming at zoos and aquariums. Research has shown that education or awareness alone does not typically lead to behavior change (Ardoyn, 2009). Similarly, empathy towards animals and their ecosystems does not necessitate behavior change (Heimlich & Ardoyn, 2008; Kollmuss & Agyeman, 2002). It is important to note that this does not mean that education and direct animal experiences have no impact on behavior change; they do. However, without the specific incorporation of behavioral theory during the development process and without the practical applications of these theories, we are unlikely to see the types of long-lasting changes we hope for and possibly even tout are occurring.

My research and experience within the human behavior change realm has also illuminated a few common issues that prevent zoo and aquarium professionals from achieving their personal and institutional conservation goals. While these issues are tailored to the zoo and aquarium industry, they are very common

misconceptions generally about behavior and how it can be changed. There are two broad categories these hurdles fall within – those that are theoretical in nature and those that are practical in nature. Below I discuss each of these categories which may put institutions on the right path for effective conservation program development.

Theoretical Hurdles

Theoretical versus Practical Models

Behavioral theories are abundant and complex. Each branch of the social sciences has a behavioral theory that most resonates with their work and/or frames their approaches to behavior. As an industry, zoos and aquariums bring in staff members with diverse academic backgrounds as there is no one path to working at these facilities. My research indicated that staff have a variety of academic preparations, from biology and ecology, to psychology, education, and business. While this diversity can certainly be a strength, it can also add challenges to program development within and among institutions. This is due to the variety of theories that may come along with the diversity in backgrounds and the lack of specific education or experience in human behavior change.

Common behavioral theories referenced and utilized within the zoo and aquarium field are the Theory of Planned Behavior, Trans-Theoretical Model of Behavior Change, Value-Belief-Norm Theory, and the Social Cognitive Theory. While each of these models has been tested and provides valuable information about how behavior can be understood, these models are not applied models. This means that they do not prescribe a method for utilizing the theory in practice. For example, the Trans-Theoretical Model of Behavior Change suggests that people move through a series of stages before they perform or adopt a behavior. While this model can be useful in understanding how complex behaviors come to be and may assist in the development of assessment measures, it does not, in and of itself, provide a practical approach to moving people from one stage to another. Thus, programs developed using this theory *without the addition* of practical tools to implement the theory are not likely to see actual behavior changes. Instead, it becomes an ineffective and costly exercise that widens the research-practice gap.

Rather than developing a program based upon theoretical models only, including practical models will increase your effectiveness exponentially. Community-Based Social Marketing (CBSM) is one such approach that has the potential for wide adoption within the industry. This approach has been utilized with success at some zoos and aquariums and offers a suite of strategies that are conducive to the constraints of programming developed for varied audiences. Another practical approach to behavior change is that of Applied Behavior Analysis (ABA). The main differences between these two practical methods is that CBSM is community focused and ABA has largely been used for individuals or small-groups. Both approaches consider the realities of behavior change such as: barriers (e.g., response effort, knowledge, convenience, etc.); benefits (e.g., social, personal, financial, etc.); and consequence contingencies (e.g., competing behaviors/reinforcers, etc.). They also prescribe methods for changing behavior following a certain series; essentially roadmaps for developing effective, science-based programs. The ABA and CBSM models incorporate the theoretical and practical aspects necessary to develop effective behavior-change campaigns. When developing programming, being cognizant of this issue can help to prevent the adoption of theories without also adopting the tools needed to implement effectively.

Behavioral Myths

Other common theoretical hurdles involve the belief in detrimental behavioral myths. There are two main myths that are prevalent in applied settings, including within the zoo and aquarium community: 1) that education leads to behavior change and 2) that humans are rational actors. As part of the theory of action I uncovered in my research, it is often believed that education will lead to behavior change. The misconception is that if people were only *aware* of the issue that a certain behavior causes or contributes to, then they will change that behavior. The behavior in question is frequently framed within the zoo and aquarium industry as a detriment to the animals that are a part of the program: “Using rodenticides can harm wildlife, like this red-tailed hawk we have here today.” Unfortunately, knowledge about an issue alone is not enough to change behavior (McKenzie-Mohr, 2011; McKenzie-Mohr & Shultz, 2014). Human behavior is maintained by a multitude of factors and general information does little to influence these controlling mechanisms. Knowledge *can* be a barrier to behavior adoption; however, it is rarely the lone factor and maintaining this assumption only lessens the actual impact your programs can make. Consider for a moment this essay, which serves as an educational document that brings to light some of the issues program developers encounter when designing programs with behavioral targets. Although it may raise awareness or

provide information that increases your knowledge about the topics, it is unlikely to change how programs are developed on its own. The reasons programs do not include the components I am discussing are much more complicated than a lack of awareness. The information provided here can serve as a foundation from which to launch from and more targeted efforts would need to be taken to change how programming is designed. In order for animal ambassador programming to have true behavioral impacts, targeted behavioral approaches must be included in the design, implementation, and evaluation for each program in addition to the educational (knowledge) and affective (empathy) components.

The second common behavioral myth is that humans are rational actors. Most behavioral theories make this, often implicit, assumption; another reason theoretical models are not necessarily practical models. While we like to believe we behave in rational ways, research and experiences conclude otherwise (Ariely, 2009). Our behavior is often dictated by things we are not aware of, such as social norms, the effects of anchoring, confirmation biases, and loss aversion. These concepts are explored in-depth in the behavioral economics field and are key contributors to our behaviors, not only as consumers, but as everyday citizens. For example, people exposed to arbitrary numbers before being asked to bid on an item make bids that are influenced by that number. One experiment that examined this phenomenon of anchoring showed that students exposed to a higher, random number before a bidding activity tended to bid higher than those exposed to a lower, random number (Ariely, 2009). The mere suggestion of a number, in this case they used the last three digits of the student's own social security number, impacts how people behave, completely unbeknownst to them. Some of these concepts are beneficial to understand and consider when developing programming to avoid the pitfalls of assuming rational actors will be attending your program. Being aware of these factors allows them to be combatted or leveraged depending on the program goals. The CBSM approach builds in the ability to determine what other influences may be at play for a behavior. For instance, an important step in the CBSM process is to determine what the barriers and benefits are to engaging in the target behavior. This is done empirically and is not based on what is *assumed* to be a barrier or benefit. As part of this research, social norms are regularly uncovered as a factor in whether or not a behavior is taking place. Armed with this information, the social norm can be mitigated or a new social norm can be created to support the adoption of the target behavior. Keeping in mind that strict behavioral theories typically assume rational actors, and we are anything but, helps to create more effective programs.

Practical Hurdles

In addition to theoretical hurdles encountered by zoo and aquarium professionals, there are also three common practical hurdles that can be mitigated to increase program efficacy.

Too Many

Often times programs at zoos and aquariums suggest multiple behaviors that guests can engage in to assist in conservation efforts. While this seems like a viable approach and covers many different ways people can get involved, research has shown that too many options can lead to decision paralysis (Iyengar & Lepper, 2000; Schwartz, 2004). This means that instead of choosing one of the many options presented, guests may more likely choose nothing at all. It is much more effective to limit the options given to guests in terms of how they can contribute to conservation efforts. Limiting the options also makes evaluating the impacts much easier to measure. This approach may feel counterintuitive to many professionals in this field since we understand the dire circumstances facing our planet and it would seem that encouraging many behaviors is better than one. However, targeted, focused messaging around very specific behaviors appears to be a more effective approach to bringing about measurable changes to behavior. This is especially true when behaviors are carefully chosen and based on a scientific approach. Choosing what specific behavior to target is a science and one that the CBSM approach weighs from multiple angles. Considerations such as how impactful the behavior is and whether or not the audience would be able to adopt the behavior all factor in to the decision.

Reducing behavior asks in a program can also be viewed as a way to build a conservation repertoire for your guests. Building a behavioral repertoire takes time and is best accomplished incrementally. Just like animal trainers build behavior repertoires with their animals, the same can be done with guests to your facility. Allowing people the opportunity to “practice” conservation behaviors builds behavioral efficacy and personal agency – two important components of sustained behavior change (Bandura, 1977). Encouraging this development, even if it seems as if it is on a small scale, can have impacts far beyond the gates of your institution. Zoos and aquariums are not solely responsible for the changes that need to occur within our society

to conserve wildlife and wild places. The industry can, however, make increasingly more meaningful contributions towards this substantial goal by focusing on what can actually be changed and continually evolving by adapting best practices whenever possible.

Too Broad

Zoos and aquariums have unique challenges when developing programs in that the audiences can vary widely. As a result, programs are regularly designed to reach a broad audience. A pitfall to this technique is that the messaging is then not relevant to any group. There are multiple ways to segment a zoo and aquarium audience and include basic demographics, identity-related motivations (Falk et al., 2007), stage of behavior change (e.g., Trans-Theoretical Model), and behavior-specific approaches. When a specific audience is chosen, it does not mean that the content can only be consumed by that particular group; it means that the content is developed to impact that specific group over others. The reason an audience is targeted depends on what the program goals are and if that group would provide the most meaningful impacts. For example, during research for a human-wildlife conflict project I found three main subgroups of people impacted by the issue. Each group receives information from different sources and also engages in different types of behaviors when dealing with this particular species. Developing a campaign that intended to capture all of these differences at once would not be an effective solution. Thus, I will target one or two of these groups specifically depending on the overall goals of the project. The strategies and messaging employed will differ based on the group which increases the efficacy of the overall program. Keep in mind that tailoring your messaging and tactics to specific subgroups does not limit the reach of your programs as a whole; there can be more than one approach within a program or across programs to reach multiple audiences. The key here is to collaborate among institutional departments to ensure mission goals are being met through the aggregation of individual programs.

Too Big

In addition to too many behaviors being targeted among too broad of an audience, programs can also have a goal that is too big. Some behavioral theories, such as the Value-Belief-Norm model, suggest that behavior is controlled by an individual's value orientation and their beliefs. While this may play a role in behavior, attempting to target values and beliefs in programming is ineffective. Value orientations and beliefs structures are incredibly enduring and research has shown that they typically do not change much over the course of people's lives (Fulton, Manfredo, & Lipscomb, 1996). Furthermore, audiences at zoos and aquariums may only be in contact with a program or effort for a very brief period of time – sometimes as little as 10 minutes. It is unlikely in these cases that someone's core values will be dramatically influenced, and confirmation biases often prevent people from acknowledging information that is counter to what they already believe. Instead, focusing efforts on individual behavior changes eliminates these issues. The reason this technique works, as mentioned previously, is because behavior is controlled by more than just values and beliefs. As any animal trainer knows, consequences play an enormous role in motivating and eliminating behavior. An interesting by-product of targeting specific behaviors over values is that the change in behavior can have an impact on values via cognitive dissonance and self-perception theories (Bem, 1972). Cognitive dissonance is the mental struggle we feel when something we do is different than what we believe and vice versa; it describes the inconsistency or incongruity in our thoughts and actions. This state is uncomfortable and we typically change one of these components so that our beliefs, attitudes, and/or thoughts are consistent with our behavior. Self-perception theory postulates that we develop attitudes as a result of our overt behavior; we use the behavior itself as a cue to consider what it must mean that we took that action. This implies that, although values and beliefs influence behavior in some ways, the behavior itself can also influence the values and beliefs we hold. In practice what this means is that when guests have the opportunity to engage in behaviors that are related to conservation, it may facilitate the development of an environmental identity. This identity crosses boundaries of location, time, and behavior – consider how many behaviors you have adopted as a result of your identity as a zoo and aquarium professional (hello reusable straws and water bottle carriers!). When creating programming, consider how one small action taken at your institution may impact future behaviors and the formation of a guest's environmental identity.

Tying it all together

Professionals in this industry strive to create the best living situations for the animals in their care. This is no small feat and the time and dedication it requires is enormous and often underappreciated. As the industry becomes more and more scrutinized, it is important to continue to update our approaches to animal management. Today, the direct impacts animal programming has for guests and the community have become

a part of the animal management landscape. Concerned citizens and animal rights groups challenge the benefits the industry claims result from visits to these institutions. It has thus become critical to provide real, measurable impacts from programming at zoos and aquariums. This task can seem daunting, however, there are many ways to incrementally adopt more effective approaches; after all, successive approximations do work! Hiring outside help with consultants can add incredibly beneficial perspectives and objective evaluations of what will and will not help to realize program goals. Although zoo and aquarium professionals are multi-talented, they are also typically overloaded. Utilizing outside expertise to create the foundation for future programming will likely have a significant return on investment. Additionally, tapping resources within your institutions is a valuable opportunity for this field. Zoo and aquarium practitioners are uniquely positioned within our communities to understand and appropriately apply behavior management techniques with guests as a result of their behavioral knowledge and dedication to conservation. Since the principles of behavior hold true across species, your institutions have a largely untapped resource that can help to inform and implement behavior-oriented program development. From a global perspective, zoos and aquariums have the ability to impact hundreds of millions of guests annually. With intentional evolution and continued refinement, zoos and aquariums can have an incredibly powerful impact on the future of all wildlife.

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"What's App With That?"

A Closer Look at How Technology Can Assist Us With Our Animal Goals

Scott Trauger CPBT-KA, Senior Trainer
Natural Encounters, Inc.

Technology has changed the way we communicate. In our field, possibly more than others, we still rely on actual physical communication to facilitate our jobs. What if there is a way to keep that personal connection while still allowing us to achieve animal-based goals with a better antecedent arrangement? At NEI, we have decided to embrace the future and find new ways to help us achieve our goals using current technology. This paper will look at the specific tools and scenarios in which these technological applications might be beneficial to you to achieve your animal goals.

TECHNOLOGY I: The BDC

At NEI we believe that clear communication with both animals and people can best set us up for success. The hardest part about this for our team is that we can often be scattered across the state, country, and sometimes even the globe. How can we have a real time notation system that will allow us all to share anything we could possibly think of in regard to animals in our care? In, 2014 Steve Martin, President of Natural Encounters, Inc., Dr. Susan Friedman, PhD, and Daniel Ladner, software engineer, collaborated in the design and creation of the innovative internet-based database affectionately referred to by our staff as the BDC. This acronym stands for Behavior and Data Catcher.

First, this internet-based technology allows us to physically locate and keep a current data file on every individual bird that is part of the company from anywhere with internet access. In the year 2018 alone, we had birds and team members at our home Ranch facility, two separate facilities at Disney's Animal Kingdom, as well as a team at the Indianapolis Zoo. If you wanted to review medical or training records on a bird in Indianapolis and you were in Florida at the Ranch, it could be done instantly. Suddenly, any information you could possibly need about any animal is at your fingertips. The birds are organized by location. If a bird moves to a new location, we can transfer their entire record, see exactly what has happened recently, as well as historically, and often troubleshoot any challenges we might be having by simply looking through these files. For example, let's say we move Sweet Pea, a Trumpeter hornbill, from the Ranch up to one of the Orlando teams. Once we import that file (with just a few clicks), we can see her diet records, medical history, training history, and all relevant notes in one place.

Second, this allows us to streamline our husbandry routines. We weigh all of the birds regularly as a source of preventative medical monitoring. Trainers text the weights to our diet writer as they weigh the birds using WhatsApp, a technology we will discuss in detail later. As the weights come in, our diet writer enters the bird's diet for the day into the bird's record in the BDC. Each daily record for each animal is called a "vital". The collection of all the bird's daily vitals comprises the bird's complete "record". From that point, since it is all streamed through the internet (encrypted for safety), our diet makers can pull up the individual animal records on a "Kitchen List", which lists all the birds and their

diets for the day, and make the diets in an entirely separate location as the diets are being written. This clearly beats the older, more time-consuming method of first writing down weights and then diets on paper charts and then turning those papers over to a diet maker to begin making diets. As diets can now be made simultaneously while they are being entered, we are also saving a significant amount of paper.

Third, this is a great tool to quickly review past diets and quickly and easily vary what diet items an animal gets on a day-to-day basis. This allows us to keep the diets and, therefore, the reinforcers we will use in training and shows variable, which in turn can help lead to more consistent and desirable behaviors. Each bird record has a number of fields in which a diet item and amount of that item can be entered. Each field has a drop-down menu with all possible food items listed to choose from (**See Figure 1**). For a raptor for example, the diet writer would enter amounts (weighed in grams) in fields for day old chick, rabbit, mouse, rat, BOP meat (carnivore diet), etc. For a parrot, the fields could include pellet, fruit and vegetable mix, any one (or more) of a number of types of nuts, etc.

FIGURE 1

When we go to create a diet in the morning, there are two possible ways to add a vital and each way gives slightly different background information. 1. Go to the bird record and hit “add vital”- that brings you to a page with the past four days. 2. Go to the bird record and click on (open) the record. You see all the bird’s vitals. From that screen you can also click on “add vital”. Like #1 it shows the past four days, but doing it this route you can see more than four days before writing the diet.

Another benefit to this system is the ability to write down any relevant notes in that animal’s vital. There is a general note field in each bird’s vital in which we can write down detailed training, medical, show, and other notes. This is a huge help in finding trends as to why a behavior might be breaking down, whether or not to increase a bird’s target weight, and other pertinent information. There is also the ability to write a “common note”. This is used when we want to put the same information in several birds’ vitals. For example, we have flocks of parrots that contain anywhere from 6 to 20 birds in a flock. If we want to add a training note to the vital of every bird in the flock, we can click “select”, then click on each bird’s vital that we want to include the note in, and then click on “common note” and add the note. We also have the option to add a “milestone” note, such as a vaccination or other relevant medical information, an ad lib weight, or any other information we want to be able to see every day without having to click on a vital and search the bird’s record. In addition to this, when a diet writer writes a note in the general note field of a bird’s vital, that note will carry over to the next vital the trainer opens until the trainer changes the note.

Like all things we do in life, we are constantly observing, evaluating, and adjusting our practices in an effort to improve them. We have found that it is best to have a strong internet connection with plenty of

bandwidth to use the BDC to its fullest capabilities (such as having multiple people using the database simultaneously during morning husbandry). Also, to pull up an entire record for a bird that has a long history with the company can take unnecessary amounts of download time when you just need to review the bird's recent history. For this reason, our BDC has the time saving option of pulling up records for 3, 7, 14, or 30 days, in addition to the entire record for an individual.

While this technology proves invaluable on a daily basis, it should be noted that starting up an entirely new and custom database can present its own challenges. In order to design something this complex, it takes a collaborative effort and people with the right skill sets. You need a software engineer for the build, a liaison that understands how both the software engineer and the animal care process works, and a strong grasp of the exact needs for the program development. Our common note feature listed above was an addition to our original database built well after the software originally rolled out due to the needs of our Winged Encounters team. Making sure edits or additions can be made, or that your software is flexible to change, is another thing to consider. Building a database from scratch, as well as building in any additions or changes, can end up being costly, too. Make sure to weigh the pros and cons and see what might work best for your individual situation.

TECHNOLOGY II: Box

Box Sync is a desktop sync application that keeps all your files safe and secure in the cloud while having them available on your computer and accessible from anywhere with Wi-Fi, on any device with Box mobile app. This software, and its applications over the cloud, allows us to share documents company-wide with a simple login. We use this technology in a variety of ways.

First, we use it for our important company-wide documents. These include things such as our employee handbook, AZA accreditation manuals and forms, etc. This allows all employees the option of viewing any materials from either their phones, tablets, or computers whenever they like. Also, as a company dedicated to being as green as possible, this saves on countless pages of paper that would've potentially been printed before we had this file sharing technology.

Another benefit for us is sharing our schedules. Once again, this saves us having to print them out and post them at each location, but there is also a greater benefit. In our company, it is common for people to be trained at multiple facilities. In the event that there will be reduced staffing at a location one day, or if there may be a special event at another location, the management can quickly review all schedules and see where they can pull staffing from without having a negative impact on any team. All staff has access to all schedules which may facilitate trainers spending time together on their days off.

Box can also be used to share educational and enriching materials including but not limited to our monthly newsletter. This technology allows us to view a really entertaining compilation of the goings on in the company at each location over the past month. Each team contributes an update and photos so everyone gets a peek into how all areas are running. Any and all team members are encouraged to contribute content. It's stunning to look at, keeps our company more informed about each other, and aids in information sharing, thus reducing the likelihood of communication breakdowns and creating a more cohesive team.

TECHNOLOGY III: Snapchat

This technology is probably more common to the younger crowd. While we don't utilize this as a primary tool, we do use it as a different form of communication for staff entertainment. Each area has

their own snapchat group and we tend to post things that we think will brighten each other's days. These may be something goofy someone is doing or just something that may make you smile. Positivity and laughter are always appreciated so this technology helps us achieve that.

TECHNOLOGY IV: Google Maps

This technology has been around for quite some time and people are probably quite familiar with it. The real benefit is the application of it towards our specific jobs. It isn't a technology that we utilize daily, but, when we need it, it becomes quite handy. For example, during a fly off where you don't have line of sight with the bird and you send out staff to canvas a large area, we have found it helpful to have individual staff drop a pin on a map of the area to show where they are (See **Figure 2**). This helps us optimize coverage by avoiding having areas that are either too dense with staff or too lean. This same principle applies during a fly off when we do have line of sight with the bird and we want trainers optimally spread out to hopefully see where the bird goes when it flies from its current location (See **Figure 3**). The question then arises, "How do we share these pins with the team quickly?" The answer lies in one of our favorite technologies to date.

FIGURE 2

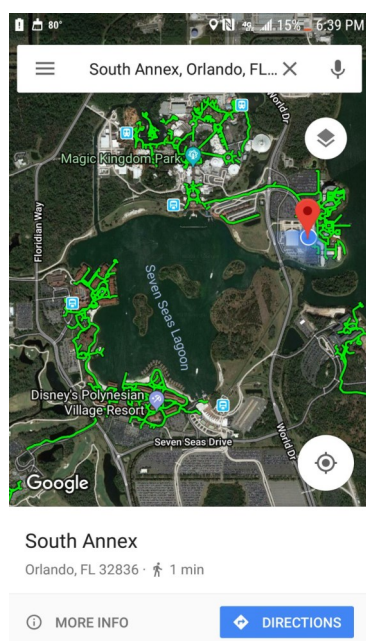
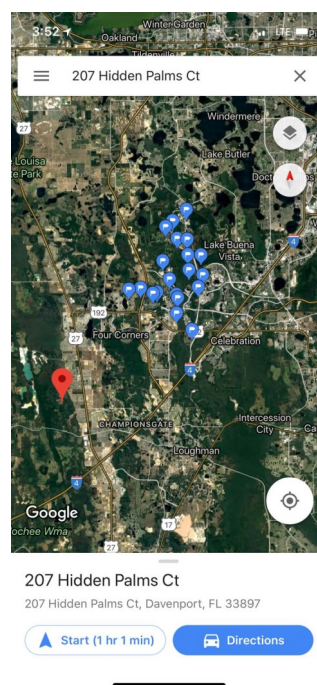


FIGURE 3



TECHNOLOGY V: WhatsApp

This application has been a game changer for our company. WhatsApp Messenger is a FREE messaging app available for iPhone and other smartphones. WhatsApp uses your phone's Internet connection (4G/3G/2G/EDGE or Wi-Fi, as available) to let you message and call friends and family across the world. You can create groups with multiple trainers in each group and it is easy to add or remove people as staffing changes. It also allows for multimedia messages. You can send and receive photos, videos, and voice messages. Most people are already familiar with this technology, so once again, how can it help us?

First, like Box and Snapchat, we created a variety of groups to help with communication streams. We have a company-wide group, individual team groups, and even sub team groups for specific areas of show or husbandry. These small groups allow for critical information sharing about specific topics among trainers that don't have many overlapping work days. For example, we have a "Macaw only" chat for those

trainers who are developing and evolving the behaviors of the macaw teams in our new show. We have a “Photo Friday” group for posting medical related bird photos so we can quickly reference and compare these photos to see, for example, how injuries are healing over time. We also had a “Presenter” group for our stage presenters to share script changes. These smaller groups allow us to pinpoint the audience we wish to share information with.

In our daily routines, we weigh birds every day, with each individual being weighed several times a week, as weights can be one indicator of health for an individual. At one of our show facilities, we have several trainers all weighing different birds at the same time. All of these people enter the weights into the app on their phones and we have a diet writer at a computer in a different location (even at their house, if needed) entering the weights into the BDC and writing diets for the birds. This facilitates a much quicker, smoother, and more eco-friendly transfer of information as opposed to writing down every weight on a sheet of paper and bringing those papers to the diet writer (not to mention the paper method wouldn’t allow diets to easily be written from off-site when necessary).

We also use WhatsApp to upload pictures and videos of animal behavior. Sometimes this might be pictures of a feather abnormality or an injury. Other times, it might be pictures to monitor foot conditions on birds. If we see a behavior that is out of the ordinary, we can quickly share a video of exactly what we are seeing instead of relying on the telephone game to describe the behavior. It can also be used to share show behaviors or training sessions so others can offer input or maybe just give the trainers some good old R+.

Where we have seen it come in handy most is during flyoffs. When we were training 24 macaws for the opening of our new show in April 2018, flyoffs were part of the learning process. We had several instances of birds leaving the theatre and, therefore, discovering the park and, more importantly, how to get back home from a variety of places once they flew out. Some birds were familiar with the area and had flown in our previous show, but we also had some newer birds in our flocks as well. One day, we had a longer than usual flyoff with two blue-throated macaws named Juan and Callie. This multiple day flyoff allowed us to really put this app to use.

As mentioned above, when we started spreading out, we would use pin drops from Google Maps and upload them onto the WhatsApp. The pin drops have been used to show where staff were stationed looking for the bird and where they may have heard or seen the bird. We also use radios, but the pin drops got us much more accurate information. The app was also helpful as our form of communication when radio signals and transmissions were spotty or when radio batteries died.

We were also able to share some entertainment during what could’ve been a stressful time. When we saw wildlife that was unique, we would share it. Some trainers uploaded videos of their experiences that were often times quite unique.

This experience also allowed us to document some of the strategies we used in order to see what worked well and could be used in the future versus what might not be as helpful. For example, Dan Blair had the unique idea to utilize two other blue-throated macaws named Mondo and Cletus who had been flown in various locations in our camp programs that year. Their behavior in camp was to be released in a field from way across the park and fly back home to Site B where they lived. This was captured on cameras and Skype and kids could see the entire process all while watching from the field where the macaws initially flew from. On day 3 of the Juan and Callie flyoff, Dan convinced Steve Martin to attempt his idea of releasing Mondo and Cletus from the front parking lot (close to where we last heard vocalizations from Juan and Callie), and see if their calling as they flew would draw out Juan and Callie. They had never been near this area before, but Dan was confident they were the right tools for the job as they had reliably flown home from various long-distance locations. Never in a million years would I have thought that the way to recover two birds

in a flyoff was to release more birds in a novel location. Mondo and Cletus did great. They screamed and flew quite a bit and eventually made it home to Site B about 10 minutes after their release. Juan and Callie vocalized in return, but Mondo and Cletus didn't draw them to fly like we had hoped. This idea was an overall success that could be used in future flyoffs, thus adding an additional tool to our training toolbox.

Ultimately, Juan and Callie were recovered about 8 miles from the park (14 miles driving time) the following morning. WhatsApp did a great job in helping us come together and successfully achieve our goal. It has often been used since and will continue to be used in the foreseeable future.

TECHNOLOGY VI: Everything Else

There is so much technology out on the market these days. I, for one, never thought when I first heard of WhatsApp that we would be using that in the animal training field, but we found ways to adapt it to our needs. Anything can be utilized depending on your individual needs. In one of our shows, we are working on extending the time of the shows. We have found that the stopwatch function on our phones, combined with WhatsApp has given us the data we need to grow that show. We time each show with the stopwatch and then screenshot the show time to the group WhatsApp so we can track show lengths. Something as simple as this could be all you need to elevate your work to new heights that were previously unreachable in the past. Just remember to ask yourself, "What do we need to get done?" and the tools will be out there to answer your question (It just might take your younger staff members to help you learn how to answer it better).

Incredible Ibis

Karena Marrero

San Diego Zoo Safari Park

*When visiting a bird show, ibis are a species that are not often represented. At the San Diego Zoo Safari Park, we are lucky enough to work with two different species in our collection. We have scarlet ibis (*Eudocimus ruber*) and sacred ibis (*Threskiornis aethiopicus*) flying three different natural behaviors in our show. In addition, our ibis are trained for personal interactions with guests and for a multitude of voluntary medical procedures. Our goal for this paper is to show how adaptable ibis can be to husbandry training, show behaviors and helping encourage our guests to conserve animals.*

The San Diego Zoo Safari Park has seven scarlet ibis separated in to two groups: a flock of five and a pair. We also have two individually housed sacred ibis. All scarlet ibis are trained to do different behaviors in the show, personal interactions outside of show and husbandry behaviors behind the scenes.

Show Behaviors

Ibis are naturally found in flocks, wading around in wetlands and using their beaks to get insects and crustaceans for food. In our free flight bird show, we showcase all three of these behaviors. Our five scarlet ibis exhibit a flock in flight, the scarlet ibis pair shows off foraging for fish and the sacred ibis individuals show off the adapted beak for foraging through a competition.

The flock in flight behavior was trained by integrating our flock of two scarlet ibis, who already knew the behavior, with three scarlet ibis we acquired to make the flock of five. For the three new ibis, we trained them the beginning of the behavior and the end. Our original plan was to have the two veterans show one new flock member at a time, the middle part of the flight by adding them to the routine once they seemed confident with the beginning and the end of the behavior. We started with our most confident new individual. Unfortunately, after several tries, food competition caused the new ibis to feel less confident flying with the veterans, so we decided to change up our plan. We took the three new scarlet ibis and trained them to fly the middle part of the behavior. Once they were consistent, we put all five birds together in the crate and flew them as a flock. We learned that having several repetitions from the same spot helped the five figure out how to fly out of the crate comfortably together. With those repetitions and approximations around the blind corner, we finally had our flock of five in show!

For the scarlet ibis pair, we reshaped a previous behavior. Originally, the birds would fly down from a hillside and land in a pond on stage. There, they would forage for fish in the pond then go over a wall and into travel crates. We decided to change their entrance, take the pond out, and have them forage in a tree trunk, and eliminated the crates at the end. We started with training them to end their behavior in their enclosure, instead of where the crates were set. After they had that down, we started reshaping the forage behavior. We got rid of the pond and fashioned PVC tubes to fit in the holes of the trunk, so the ibis would use their beak to “dig” in the stump for their food. We trained this part to each bird separately, in their enclosure. We had to train the individuals that there was food in the tubes, then introduce the same tubes to them in the stump.

Once they got the foraging down, we started approximations toward the beginning of their full behavior by slowly moving them backwards from the foraging at the stump. We continued to move backwards until they were flying from their entrance, foraging on the stump and flying themselves home. The sacred ibis was trained a similar behavior but on a different stump that had one tube and then he flew in to where the scarlet ibis were getting released.

For the beak adaptation behavior, we trained one of our sacred ibis to eat food items out of a tank filled with water. To make this interactive and engaging, we added a human using chopsticks in place of the ibis beak to get items out of a different tank of water. During the routine, the guest and the ibis race to get the fish/items out of the water and see who can do it better and faster. The first step to this behavior was having the bird be released from his crate and then reinforced for landing on a platform, flying from point A (crate) to point B (table). We kept the table in the same spot, center stage, and used approximations to move his release point to behind a wall. After having him at his final release point, we then began to add the tank on the table. We started with a small tub of water and gradually increased the size of the tub to the end size of the tank.

Guest Interaction Behavior

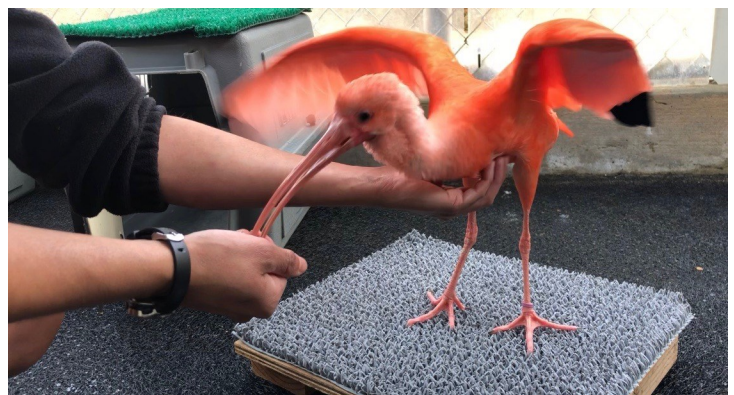
In addition to the flight behavior our scarlet ibis do in the show, three of the individuals are trained to do personal interactions. At San Diego Zoo Safari Park, we offer behind the scenes tours to our guests. Guests pay a little extra to essentially make their own safari at the Safari Park. When the guests decide they would like to meet a bird, they come to the bird show. We have several birds that are trained to meet guests one on one. The scarlet ibis are one of them. We have trained them to fly up on to a table and get fed by guests, either out of the hand or out of a clear tube. The clear tube shows off the beak adaptation and limits dirty hands, if the guest prefers not to touch the treats. If the guest is brave enough, and wants a little more interaction, the ibis are trained to fly up on to the arm of the guest.

Throughout the year our team is occasionally asked to do an extra show, in addition to our regular day. These shows are usually to celebrate some kind of milestone or special acknowledgement within the Safari Park, like member or volunteer appreciation. During these shows, we will pick some volunteers to come on stage. We have the volunteers hold their arms straight out, then have the ibis walk across their arms.

These interactive behaviors are done within a normal day of shows. Essentially, the ibis could fly their flock flight at noon, then meet and greet with guests at 12:30pm, and then fly again in the flock at our 2pm show. They prove to us just how versatile they can be on a daily basis.

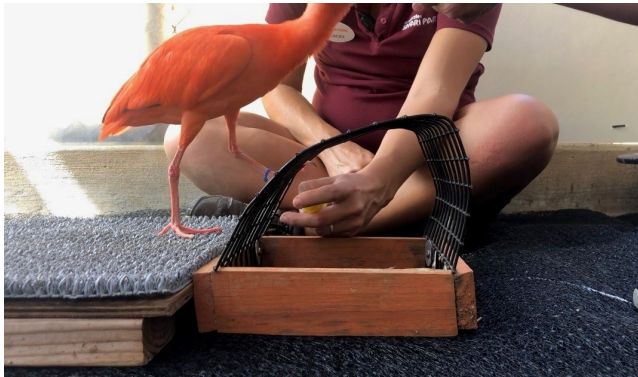
Husbandry Behaviors

Not only are our ibis trained for shows, but they are also trained to participate in a multitude of husbandry care behaviors. These include voluntary nail trims, voluntary keel feels, and voluntary foot care. Our scarlet ibis flock is trained for all three of these. Our sacred ibis are trained for the voluntary nail trims and we want to work towards training keel feels.



With the scarlet flock and the sacred ibis, we trained each individual to step on a small platform as a station. This was the basis for the rest of the behaviors. For the keel feel, we had the individual station on the platform. We reinforced her for standing on it and letting a trainer approach with a free hand until we were able to touch her keel. For the nail trim and tuff foot spray, in addition to the platform, we introduced a nail trim perch that is essentially a piece of coated wire mesh bent in a U shape. We have the individual station on the platform then step on to the perch. Once this behavior was solid, we brought in a second person holding the Dremel or tuff foot spray.

For the nail trim, the individual was reinforced for both feet on the nail trim perch. We started with the sound of the Dremel on, but not directly under the perch, to get the bird used to the new noise. Once the individual seemed confident with the noise, we moved the Dremel underneath the nail trim perch and had the bird step on and off the nail trim perch while the Dremel was underneath. After seeing consistency with the bird, we then started to touch a section of the nail trim perch. This was an approximation to get the bird used to the sensation of the vibration without immediately touching the toes. Once the bird seemed comfortable with the noise, the vibration and the movement of the Dremel underneath, we then started touching the nail. This was done by pairing the reinforcer with a quick touch of the Dremel to the nail. So long as the bird stayed on the perch, we continued this until we were able to build duration of the Dremel filing down the nail.



For the tuff foot spray, we introduced a third mesh perch that was similar to the nail trim perch but had a different angle. The purpose for this was to minimize the chance of spray getting on the feathers. In this behavior, we had the individual put one foot on the perch while the other foot stayed on the platform. When this was consistent, we introduced the small bottle of spray, done by a second trainer. We approximated the bottle underneath the bird. Once the bird was comfortable, we slowly sprayed the feet and paired the actual spraying with the reinforcer. If the bird hopped off, we simply asked her to come back on the perch and resume the position to spray again.

In addition to nail trims and tuff foot spray, we also have a “mirror box” where we can check the bird’s feet. The birds are trained to step up on the platform and then on to the box. There is a mirror on the bottom which reflects the bottom of the feet. The trainer reinforces the bird in a steady (head up, still) position while getting a look at the bottom of the feet in the mirror. Trainers are also able to take photos of the feet to keep data on seasonal changes or any minor injuries noticed. This tool is great because we are easily able to check feet when we notice a sore or any kind of foot problem.

With these mesh perches and the mirror box, we are not only able to do these voluntary behaviors, but we are also able to do daily/weekly foot checks when needed. It is also possible for us to check the bottoms of their feet regularly by asking them to walk onto a box with a mirror on the bottom of it, so we can see the underside of their feet.

Conclusion

Often, ibis are seen in aviaries and can be overlooked because of everything going on in the aviary setting. Through this paper, we hope to inspire others to look at these birds with a fresh perspective. They are easily trained and highly intelligent, and we have found they can do so much more than sit in the aviary or fly an A to B in a bird show. Through our training, we have pushed the limits to increase the behavioral repertoire for all our ibis. We only hope to continue pushing those behavior limits to include even more voluntary behaviors. Show behaviors, personal interactions, and husbandry behaviors are only the beginning of the road for our scarlet and sacred ibis.

Creating a Positive Reinforcement Training Program for Former Dancing Bears in India

M.E. Hampton

Little Rock Zoo

*In 2018 I made two trips to India to work with Wildlife SOS (WSOS). My experience began as a representative of Little Rock Zoo on a Bear TAG sponsored trip and grew into a partnership to facilitate positive reinforcement training with former dancing bears. Dancing bears are sloth bears (*Melursus ursinus*) that were used by the Kalandar people in a cruel practice involving poaching a young cub, killing its mother, breaking the cub's canine teeth and driving a hot poker through their nasal cartilage so a rope can be threaded through to control them. They were then made to "dance" for tourists. Thanks to WSOS the practice of dancing bears no longer exists in India. WSOS rescued over 600 dancing bears and now houses them in four facilities throughout the country. I helped form a positive reinforcement program at two of those facilities: Agra Bear Rescue Facility and Bannerghatta Bear Rescue Center. The introduction of positive reinforcement training has greatly increased the welfare of these formerly abused bears. The training has improved the relationship between the keepers and the bears, as well as decreasing overall anxiety as demonstrated by decreases in den-shy behavior, decreases in stereotypic behavior, and increases in both attention and participation. Positive reinforcement training is new to India. Being invited back to train Indian staff by WSOS demonstrates their commitment to improving the lives of these bears, and we at Little Rock Zoo are offering continued support to improve animal welfare around the world.*

In 2018 I made two trips to India to work with Wildlife SOS (WSOS). My experience began as a representative of Little Rock Zoo on a Bear TAG sponsored trip and grew into a partnership to facilitate positive reinforcement training with former dancing bears. WSOS successfully ended the practice of dancing bears in 2009 by using a multi-pronged approach to the problem. As part of ending this practice, they rescued over 600 bears from the trade that were placed into one of their four sloth bear sanctuaries. I helped form a positive reinforcement program for those bears at the two largest WSOS bear rescue facilities. The introduction of positive reinforcement training has greatly increased the welfare of these formerly abused bears. The training has improved the relationship between the keepers and the bears, as well as decreased overall anxiety and increased both attention and participation. It has been an amazing experience to see the change in the bears and the keepers' perspectives on training and relationships.

As with any animal, it is important to know your animal's history. Dancing bears are sloth bears (*Melursus ursinus*) that were used by the Kalandar people in a cruel practice involving poaching a young cub, often killing its mother in the process. Once captured, the cub's canine teeth are broken, and a hot poker is driven through their nasal cartilage so a rope can be threaded through and used to control them. They live the rest of their life at the end of a four-foot rope and are made to "dance" for tourists by having the rope pulled on so they stand up and "dance" due to the pain inflicted by the pulls of the rope (Fig. 1). The wound in their nose is never allowed to heal while the rope is still in place. The practice began about 400 years ago when the nomadic people, Kalandars, would use sloth bears to entertain royalty. Over the decades it evolved into a trade of begging for money from tourists. Although tourists would often give money, thinking it would be used to feed the bear, the bears were often fed minimally or given improper

food and therefore suffered issues from malnutrition in addition to injury and death at an unnaturally young age. Wildlife SOS was founded in 1995 with the goal of eliminating the dancing bear practice in India. A 1996 survey by WSOS estimated there were 1,200 dancing bears in India. Through a lot of hard work and negotiation with the government in India, WSOS had the last dancing bear surrendered to them in December of 2009. In total, WSOS has rescued over 600 dancing bears who are now housed in four bear rescue centers throughout India. WSOS has spent many years healing wounds and giving freedom and comfort to the former dancing bears.

Wildlife SOS has been a conservation partner of the Bear TAG for many years, and the trip in February of 2018 was an opportunity to expand the relationship and increase knowledge sharing between both organizations. During this visit it was discovered that WSOS would like to start a positive reinforcement training program with their rescued sloth bears. Although positive reinforcement training was being used at the elephant rescue center near Agra, it had not been introduced to any of the captive bears. I was able to extend my trip for an additional week to introduce a training program with these formerly abused bears.

Agra Bear Rescue Facility (ABRF) was opened in 2002 and is now home to almost 200 sloth bears. It is near the Taj Mahal, where the streets were once lined with dancing bears, and is therefore the largest WSOS bear rescue center. Initially bears were selected for training by the veterinary staff for various reasons. Some bears were considered nervous or shy and were therefore difficult to examine and treat when needed. Other bears were aggressive, and it was difficult to do even a visual exam. Several bears have health issues and need routine work-ups for chronic disease monitoring; this could mean multiple sedations in a year. Another group was selected because they were young and will be at the center for the next 20-30 years, so they wanted to get some baseline training done for future needs. All of these bears were given priority goals by the veterinary staff based on their potential for future treatment.

At the end of my trip in February, we had worked with 20 bears and their seven keepers to finish training 54 behaviors. We made significant progress on an additional 28 behaviors. We also accomplished one successful voluntary blood draw. Not bad for a week's work! Although there were many successes in that week, for me, one keeper and one bear really stood out as representatives for the program.

Rose was two years old when I met her. She had survived being caught in a poacher's snare and as a result, lost her front left paw. She was found by WSOS at just three months old with the traumatic injury and went through extensive treatments to heal the wound. Her difficult experience and intense treatment made her a challenge for the WSOS staff to work with on a daily basis. I was told she was a "wild bear" and very shy. The ABRF staff claimed she "avoids people" and "won't do anything for you." She was the only bear I personally trained, and she became my focus for the week; with her, I had a "clean slate." The first change I made was to give her control at training sessions by leaving her den door open. This is not always an option at ABRF because the bears are housed in groups, but Rose was living alone due to her age and limited mobility. At the first session, she immediately ran out of her den, but her curiosity brought her back to the doorway where she sat shaking with nerves but interested in my presence. I was able to toss her a few biscuit pieces and our positive relationship was born. As she slowly approached and began to trust me, we began more formal training. At the end of the week she would be waiting at the door for the training sessions to begin! She learned mouth open, up, down, followed me to different training windows and was putting her paw out as the start of blood draw training. Most importantly, I was able to transfer all these behaviors to her primary keeper, Mathura, so he could continue the training after I left. I am also happy to report that on my return trip in December she had been moved into the juvenile group of bears. She still comes in for training and is separated into a den but does not exhibit anxiety with the door closed during her training sessions as she had when I first worked with her in February (Fig. 2). I could see the improvement in her welfare in that she is able to live with a group, but comfortable enough to shift inside and allow regular body exams. She is a true success story.

The other stand-out for ABRF is the keeper, Veerpal. I was fortunate to work with him and a few of his

bears in February, and saw continued growth with him on the return trip in December. He really knows his bears, and he works to understand what they want and how he can use it to improve his relationship and training. In February, he had one bear under medical treatment who needed a topical spray once or twice each day. They had been doing this by crating the bear and “chasing” him into a position in the crate to treat the wound. The bear, Puru, was therefore very nervous of people and hesitant to approach. At the first session, Puru would not participate for less than half a biscuit and we had to watch from a distance as Veerpal trained because at our approach he would become very nervous and stop participating. By the end of the week, Puru was accepting smaller bits of biscuits to train, and learning to put his paw out, and we were able to watch while standing right next to Veerpal. I was even able to touch Puru’s paw in the start of blood draw training! This had a strong impact on Veerpal as he described the change in Puru’s behavior as presenting less stress and anxiety behaviors, and increased engagement with him, both in and out of training sessions. I am happy to report that on my return trip in December, Veerpal has continued to grow the program with his bears to include all of them at various stages of training and is continuing to make progress every day.

In addition to the improvements seen with Rose, the sloth bear, and Veerpal, the keeper, many other successes occurred on my return visit to ABRF in December of 2018. We added another 39 bears to the training program as well as 12 additional keepers. I was also able to progress the skills of the seven keepers I had begun working with in February. In December, we completed training 78 behaviors and had begun work on an additional 27 behaviors. One thing that stood out for me in December was the increased pride and confidence many of the keepers expressed in the care they took of their bears. They also began to set more goals for themselves and the bears in their care for my future visits. Although I do not speak Hindi, and most of them don’t speak English, we have been able to stay in contact via social media and I have received videos of their training progress. One keeper has made significant progress on hand injection training, while others continue to add bears to their training schedule. I am proud to have provided support to them and they serve as an inspiration for me and my training goals as well. Since my visit, they have found continued success getting additional voluntary blood samples, ultrasound exams and better daily care and management of all their rescued sloth bears.

When I was invited to return to India in December of 2018, it was to expand the training program at ABRF and additionally travel to another facility to begin a training program at Bannerghatta Bear Rescue Center (BBRC). BBRC is a smaller facility near Bangalore which houses about 80 sloth bears. Although BBRC had begun some positive reinforcement training a couple of years previously, it was limited to a staff of three, two of whom were the very busy veterinarians. They were having success but wanted to expand the program for all keepers to train with the goal of including all bears as well. I was able to introduce all the keepers to positive reinforcement training as each of them chose one or two bears to focus on for my visit.

We experienced success at BBRC, very similar to the success we found at ABRF. We worked with a total of seventeen bears and their twelve keepers to complete 62 behaviors and make progress on 17 additional behaviors. I was also able to advance the experienced trainers and offer them new approaches for the training they had already begun. As part of these training efforts, BBRC created a “training panel” (Fig. 3). This panel can be attached to any enclosure and allows access for voluntary blood draw, ultrasound, mouth exams and any other potential port they can imagine needing. This is further evidence of their true commitment to training and advancing positive care for rescued sloth bears.

BBRC also set many enrichment goals. One of the bigger accomplishments at BBRC was the reduction of unwanted stereotypic regurgitation in a group of young bears using enrichment. The bears had begun to engage in a “frustrated foraging behavior” of regurgitating and repeatedly eating their food for fifteen to twenty minutes after each feeding. In order to reduce this unwanted behavior, we needed to find another way for them to satisfy the biological drive of feeding, without regurgitating. This was accomplished by introducing feeder tubes of honey immediately after they finished their porridge diet. We saw instant elimination of the regurgitation behavior in five of the six problematic bears. One bear did not regurgitate the

first day but began again two days later at some feeds, but not all. WSOS continues to offer the feeder tubes and rotates what may be inside (honey, dates, juice, etc.). The reduction in regurgitation has continued. The one bear may still regurgitate occasionally, but it is rare. I continue to work with them on additional options to continue reducing this unwanted behavior. The other five bears have not exhibited the unwanted regurgitation since the feeder tubes were first introduced!

There have been many lessons learned through my work with Wildlife SOS. I have learned a lot of patience, as have the keepers with their bears. Since these bears have a negative history, it is a reminder that knowing your animal's history is vitally important. For example, a bear who was beaten with a stick may not be willing to target to one, or it must be desensitized in a much slower and longer process than with other bears. Each animal has its own motivation and should be treated as an individual, whether this means training at a certain time of day, working in a group or working solo. Each animal will have its own pattern that leads to success. To find success, we must take the time to learn their preferences. Setting goals for keepers, bears and managers will help improve accountability for all involved. And the value of a positive relationship cannot be underestimated. Although these lessons may seem straightforward, they become more important when working in another culture with another language.

What began as a Bear TAG sponsored trip to grow a relationship evolved into a true partnership to improve the lives of former dancing bears. I hope the positive impact on the lives of these sloth bears is clear. Witnessing the transformation in a bear like Rose, from scared and shaking in her doorway, to comfortably, even eagerly awaiting training, is truly remarkable. A group of bears who used to sit and regurgitate together for fifteen to twenty minutes after feeding now go off to play for an hour instead. Bears that used to run away or watch skeptically from a distance now come to the enclosure fencing at their keepers' approach, excited to engage. These effects are powerful and humbling. Positive reinforcement training is new to India and the people and bears with whom I worked demonstrate great potential for continued success. Wildlife SOS' invitation for me to return to continue to train Indian staff is evidence of their commitment to improve the lives of these former dancing bears. We at Little Rock Zoo are proud to offer continued support to improve animal welfare around the world.

Let's Get Physical: Physical Therapy and Exercise in the Geriatric Health Management of a Herd of Elephants

Laura Price

San Diego Zoo/Elephant Care Center

The San Diego Zoo's Elephant Care Center uses physical therapy and exercise in managing the health care of a herd of geriatric elephants. It is the use of therapeutic treatment for stiffness, muscle weakness and pain through targeted movement of affected areas. This is achieved by putting food in high places, hydrotherapy, laser therapy and exercise. The type of treatments and duration is determined by the needs of each elephant. We train our elephants with operant conditioning using positive reinforcement in a protected contact setting. We educate people by doing physical therapy and training sessions in front of the public, answering questions, and sharing our passion for wildlife.

At the San Diego Zoo, the Elephant Care Center was built in 2009 to accommodate the unique and special needs that a geriatric herd requires. We have two stalls, a built-in scale, two Elephant Restraint Devices (ERD), two static chutes, a Special Needs stall, and 2.4 acres of yards. We take care of four elephants: two Asian Elephants (*Elephas maximus*), Mary, 55, and Devi, 42, and two African Elephants (*Loxodonta africana*), Tembo, 48, and Shaba, 38.

The average life span of an elephant is usually mid-late forties. An elephant has six sets of teeth in their lifetime consisting of 4 molars per set. Each molar is about the size of a brick. Their life span is dependent on how long their teeth last. Our oldest elephant, Mary, is on her last set of teeth, which are very worn down. We chip all of her hay and tree branches so she can eat and digest her food properly.

Devi occasionally has problems with pulling muscles in her right front leg. We have cameras throughout our facility and use them to check how the elephants are doing overnight. If Devi has pulled a muscle, we make sure that she is sleeping, and if not, we will make adjustments to their sleeping areas to make things easier for her to get up or into a sleeping position.

Tembo has arthritis in her right front carpus, which has changed her gait over time and caused her to be "pigeon-toed." We use laser therapy on Tembo's leg and carpus to help decrease inflammation of the affected area and to promote healing.

Shaba has a chronic bloat problem that flares up periodically, so we are constantly monitoring her condition and make sure that she has enough exercise and water. Sometimes Gatorade is used if an elephant is not drinking enough. The electrolytes are good for her and she also likes the taste (our elephants prefer fruit punch flavor).

As part of their care, we do physical therapy as defined by the Cambridge Dictionary as "The treatment of stiffness and muscle weakness, and pain, especially by rubbing and moving the sore parts through exercise," (Cambridge Dictionary, 2019). We do physical therapy with our elephants four times a week, and regularly walk them for exercise to meet all of their individual needs. Physical therapy consists of the following positions being held for 3-5 seconds each, and being repeated up to three times: legs moving front and back, front legs crossing, left and right, head down, and trunk. We also put food in high places to promote flexibility and strengthen neck muscles. In this way, we are encouraging the elephants to look high and low for their food and keep them active and engaged in their environment.

We use a target pole and wooden blocks (wedge and flat square) for our elephants to step on as part of their treatment. The target pole is used to show the elephant where to place her foot. The wedge block is placed on top of the flat square block to give the wedge some height. The wedge is initially placed with the angle sloping backwards towards the elephant. Then, the trainer asks the elephant to place her foot on top of the wedge for three to five seconds and repeats up to three times. Then, the wedge is placed with the angle sloping forwards towards the trainer and the process is repeated.

We also use hydro therapy, which is the therapeutic use of water (Merriam-Webster, 2019) as part of the treatment along with pain meds and anti-inflammatories if the elephant has pulled or strained a muscle. On the first two days of the injury we use cold water, by hosing the affected area for ten minutes twice a day. After two days, we switch to using warm water twice a day. It can take days or months to heal, depending on the severity of the muscle pull.

Laser therapy is also used to promote healing by stimulating cellular activity (Animal Medical Hospital, 2019). It can range from five to thirteen minutes per session, and can be done one to three times a week depending on the elephant's needs. When applying laser therapy, eye protection must be worn by anyone involved in the procedure, in addition to protecting the elephant's eyes from the laser. This is done by someone holding something to shield the laser, either a towel or piece of cardboard or plastic, while the treatment is being applied. When doing this procedure, it is important to monitor the elephant and take breaks when needed, as we want to make the procedure as positive as possible for the elephant.

We train our elephants with operant conditioning using positive reinforcement in a protected contact setting. Operant conditioning was [invented](#) by B.F Skinner in 1938 as an individual making an association between a particular behavior and a consequence (Skinner, 1938). Positive reinforcement is something the individual wants that is paired with a behavior, and in this case the sound of a whistle is paired with food or a toy, and can also be called a bridging stimulus or a bridge (Ramirez, K., 1999). In this style of training, we use the word "good" as an intermediate bridge and the whistle as a terminal bridge when the behavior has ended.

We also do exercise walks with our elephants whether it is A to Bs with two trainers, sending the elephant from one trainer to another, or a guided walk that lasted from –twenty minutes to one hour. The walk can be slow or fast depending on the elephant. During these walks, physical therapy behaviors are either done at one time or can be broken up into separate behaviors periodically throughout the session. We try to keep the elephant engaged as long as possible by using a variety of food reinforcers during our walks. If we are walking two elephants in the same yard, we make sure to give them as much space as possible and respect the hierarchy among the elephants. We call the dominant elephant over first by name and then call the elephant of lesser dominance by name on the other side of the yard. When doing exercise walks it is important to give the elephants enough space from each other. When the trainers are finished with the session, we release the elephant of lesser dominance first and then we release the dominant elephant. This is done by saying the word, "alright". The elephant then knows that the session has ended.

Physical therapy is necessary and therapeutic for our elephants in that it promotes flexibility and precise joint movements. For example, Tembo has arthritis in her front right carpus, and physical therapy keeps her flexible. Mary, in her advanced age, needs to be flexible and keep moving to stay healthy. Shaba needs movement and exercise to ease her chronic bloat problem. Devi is in good health, but she has pulled muscles in her leg or shoulder on occasion, and the physical therapy has been an essential part of her recovery.

We do physical therapy and exercise sessions anywhere in the yards, stalls or holding areas. We do our best to make it positive for our elephants by using a variety of reinforcement and breaking up the physical therapy routine by doing it during a walk or throughout a training session. In this way, we keep it interesting for our elephants so that they will want to participate in their health care.

We do a lot of our training and physical therapy sessions in front of the public and usually have a someone doing a keeper talk or answering individual questions. We want to share our passion for elephants and wildlife. By engaging the public and garnering interest, we can make a difference in the fight against extinction.

In conclusion, physical therapy is a very useful treatment for different conditions for elephants and other

animals. It can be applied in a variety of ways for the needs of each individual elephant. We are learning new things every day and making the necessary adjustments. The most important thing is that we are improving the health and welfare of our geriatric elephants in their golden years.

Acknowledgements- I'd like to thank everyone on my team and veterinary staff for all of their help and support.

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Building a Behavioral Husbandry Program – Desert Style

Christine Montgomery
Living Desert Zoo and Gardens Palm Desert
California

In early 2018 The Living Desert Zoo and Gardens in Palm Desert, Calif. added a behavioral husbandry curator to our staff of 35 curators and keepers to assist with the training, enrichment and welfare of over 400 desert dwelling species. Since then, the zoo has been a hotbed of behavioral growth. The enrichment program was heated up through streamlining of the approval process, organizing inventory, creating a master website of approved items, creating team contests and focus months. The sands then shifted on the training program. Medical, husbandry and guest-focused behaviors had a fire lit under them under the watchful eye and guidance of the behavioral husbandry team. With the addition of the AZA welfare standard 5.1.0, a formal welfare assessment program was introduced, and sent through the accreditation process in early 2019. Diets were also evaluated, elevated, and the approval process was simplified. To say the behavioral husbandry process has been heated up is an understatement – we are at 100 degrees and we keep getting hotter! This presentation will show how the program has grown from its infancy and the innovations it has received along the way.

The Living Desert Zoo and Gardens (TLD) opened in 1970 with a handful of animal and plant exhibits. Back then, the zoo aimed to showcase and protect the desert ecosystem in the foothills of Palm Desert California. Now, almost 50 years later, the zoo has blossomed in a conservation and welfare driven facility with over 400 animals and 1,800 acres of desert landscape. In early 2018, the Animal Care department added a Behavioral Husbandry Curator (BHC) to oversee the nutrition center, training, enrichment, and welfare program for all the zoos inhabitants.

Previously, the zoo's behavioral husbandry program was driven by each area Curator and overseen by the Director of Animal Care. Together they worked within their departments to oversee training, enrichment, and welfare but this was in addition to their other job duties. A consultant, Megan Sanders, was brought in semi-annually to advise the keepers on training projects and provide them a baseline education of training.

In early 2018, the Behavior Husbandry Curator role was filled and in March, the work began. Job duties of the BHC included managing the nutrition center and creating and upholding formal enrichment, training, and welfare monitoring programs.

Methods

Updating the Nutrition Center- Marrying the nutrition center with behavioral husbandry was a strategic decision by the Director of Animal Care. Diet changes needed through behavioral observations and training could be made quickly and thoughtfully. Diets changes are now made efficiently though a three-step process. BHC and area curators communicate about a change. Diet changes of more than 10% are communicated to the vet. Diet changes are then active. In addition, having an extensive knowledge of the food acquisition process and inventory assists the BHC with food preferences and finding high value reinforcers for the collection animals.

Creating a Brand- Previously the enrichment program was loosely documented, approved, and evaluated. Natural item restrictions were imposed due to inappropriate and ineffective enrichment being deployed. This caused a new wave of enrichment approvals to be submitted which overwhelmed the keepers and curators.

Six-E was a “brand” created around the zoo’s enrichment philosophy. Enrichment should be efficient, executed, effortless, evaluated, exciting, and exceptional. Every enrichment decision made needs to tie back to these 6 core values.

Efficient- The entire enrichment process needs to be efficient and streamlined. A google form was created for the approval process. A large hiccup was deciding if it was necessary for each item to have its own form or each animal have a form for each item. It was decided to generalize the animals into like taxa and have one form for each item. This would cut down on the approvals and how many times an item was being sent through the approval process.

Even with lumping of similar taxa, there were still a lot of approval forms to approve. The zoo created an enrichment approval committee. These are trained keepers able to approve enrichment based on the enrichment meeting behavioral goals and safety protocol. They work with curators and vet staff if they have concerns. The google form allows the approver to approve the items through the original submitted form. It also allows for edits and for the submitter to check on its progress. In addition, it tracks the enrichment in an excel spreadsheet that allows for a catalog of approved items for printing for back of house areas.

Executed - The zoo wanted to create an enrichment program where meaningful enrichment was implemented, not just a box on the to do list. The zoo creates monthly facility wide enrichment schedules. Each area of the zoo follows the same enrichment schedule. Each month has a theme, ABC, behavioral goals, summertime etc. This keeps enrichment fresh and exciting for the keepers – and hopefully, the animals as well. In addition, it makes ordering items for the upcoming month easy to do on a facility-wide budget.

Effortless - In addition to the monthly enrichment schedules, the zoo wanted enrichment to be easy to implement. The zoo currently has plans to renovate the reptile house, adjacent to the existing nutrition center. This room will become an enrichment hub. Keepers will have a space (air conditioned) to be able to create enrichment easily with tools and supplies at hand. In addition, guests will have to opportunity to watch this process and ask questions about what they are creating. Currently the zoo has an enrichment storage shed for items not kept in the animal areas. Most enrichment is stored near the nutrition center so it’s easy to access when the keepers pick up diets for the day.

Record keeping of enrichment also needed to be effortless. Keepers can either use paper records or track enrichment use on ZIMS, whichever is easiest for them.

Evaluated - This is still an opportunity of growth for the zoo. The zoo will be using a SUPER model for evaluations from Oklahoma City Zoo. Existing evaluations forms are being used for zoo-wide contests and newly approved enrichment.

Exciting - Once keepers are excited about enrichment, that excitement spreads to the animals and to the guests. The zoo has done several events to keep the keepers excited and engaged. Enrichment contests and team builds are used to let keepers branch out from their existing string animals and create bigger enrichment items than they can’t build on their own. The winners receive “pronghorn bucks” which can be used to buy items in the future for contests or individual projects. The zoo also does guest builds for private events, in which guests can build enrichment devices for the animals.

Sharing enrichment successes (and failures) can also be a great way to create excitement. The zoo is currently looking at video sharing platforms to help keepers engage with other areas of the park and inspire them in their own areas.

Exceptional - The zoo has a natural only requirement for non-interpreted enrichment. The keepers have received education on creating faux natural enrichment and have been tasked with creating natural enrichment out of non-natural supplies. While some keepers see this as a crutch to creating enrichment, others see it as a challenge. The pieces the keepers have created are exceptional and often made from reused and recycled materials. An example being cactus made from an old coke bottle recycling bin. Keepers have also learned different ways to camouflage PVC such as staining and using epoxy to create bark like texture on the outside.

TRAIN – the Training Brand- The training program also received a facelift with a branding statement and vision. While the training program had a ground level of education from the consultant and keepers with some training knowledge, there was not a formal program with one person overseeing all training. Like the enrichment brand, each training goal needs to tie back to the training brand of being transparent, refined, accountable, innovative and nurturing.

Transparent - Part of the zoo’s culture is one of transparency. From the CEO down, there is a push

to open the doors and let guests see the great care that is given to the animals at TLD. Training is a huge way to bring guests into animal care. The zoo has an extensive keeper chat schedule, showcasing the training of cheetahs, giraffes, animal ambassadors, painted dog, eagle, caracal, hornbill, and badger. A training area for giraffes was built last year which allows for guests to see hoof care, scale training and blood draw training up close and personal. The zoo will continue this transparency, adding training areas in the master plan for the new rhino and lion habitats. Modifications to the warthog habitat are also planned to show injection training. In the strategic plan of the zoo, 80% of training is to be brought forward for the guests to enjoy.

Refined - The consultant work done by Megan Sanders provided a great framework for the training program to take shape. Keepers were given introductory lessons in vocabulary and training concepts. Keepers knew the basics of training and how to apply them. The training program is working on becoming more advanced with higher level training techniques such as no reward markers, redirect stimulus, least reinforcing scenarios, differential reinforcement, variable reinforcement schedules to name a few. The training program is going from reactive to proactive by adding these tools to the keeper's training tool bags. Rather than fixing behaviors as they break down, behaviors are beginning with strong training plans and goals for keepers to achieve. In addition, behavioral observational skills are being refined to recognize behavioral drift or when changes to training plans need to occur.

Moving the training program from reactive to proactive takes form through weekly vet meetings. Upcoming procedures and shipments are discussed which allows the BHC to make new training plans and goals to accommodate these procedures. Keeper chats are refined to include more guest participation activities and highlight natural behaviors of the animals on show.

Accountable - Moving behaviors forward is an area of opportunity at TLD. The BHC being able to hold each behavior to a timeline and forward moving approximations is a challenge. The BHC oversees roughly 275 behaviors. Several techniques over the last year have been tried to ensure keepers know expectations and goal behaviors. A recent survey about the training program showed that 16 of 17 keepers know their training goals. While only 8 of 17 agree that they know what their next step is for the next training session.

Currently, the BHC staff is working on creating living training plans for each behavior. These training plans will be kept in the areas the training takes place. The keepers will review them before and after a session. The training plans will have the previous approximations, current approximation and only 1 future approximation. This will ensure keepers do not skip steps in the training plan but have a clear understanding of where they are going in the immediate future.

In addition, the BHC is assigning priority behaviors to each keeper. Each keeper will have three priority behaviors that are close to being completed, completed and need to be turned over, or time sensitive. Keepers will need to focus on these behaviors and will have timelines for completion. The goal is to have them focus their attention on three behaviors as opposed to splitting their attention between 10 or more. Area curators are also holding keepers accountable of their goals with a shared list of behaviors and their goals for them to review.

Innovative - Innovative training is starting to take shape throughout the zoo. Some examples are training 0.8 warthogs in a group setting for injection training without using a restraint device like a squeeze. Another is training a giraffe to enter a shipping chute with using choice as a primary reinforcer. Choice and control are two words that are at the forefront of all training plans by using creative solutions to allow the animals to cooperate in their own healthcare. The zoo continues to look for innovative ways to train the animals and to be industry leaders in animal training.

Nurturing - Growing the keepers to be strong and independent trainers started to take shape in December 2018. The Training Club was formed, allowing for monthly lectures, demonstrations and skill building for the keepers. Training Club also appears in the strategic plan for 100% voluntary participation among keepers. In addition, the BHC has switched from focusing on growing and moving individual behaviors forward through guidance of approximations. Currently, feedback during and after sessions are geared at the keeper as opposed to the animal or training plan. Training concepts and theory are discussed, allowing the keepers to formulate the next step in the plan based on those discussions.

Welfare Assessments 1.5.0 - The recent addition of welfare standard 1.5.0 from AZA has added another level of complexity to the BHC role. A welfare assessment and schedule were created and implemented before the zoo's inspection in January 2019. Animal care staff was all trained on how to monitor welfare and fill out the assessment forms. Several tracking methods were initially trialed such as tablets, ZIMS Care and Welfare module and paper records.

TLD currently is using an excel document and excel formulas for the welfare assessments. Keepers are required to fill out welfare assessments at the animals' yearly exams. Each animal or animal group is placed into three categories of welfare concern: red, yellow, and green. Red animals are animals on quality of life watch and welfare assessments are completed by keepers, curators, veterinarian staff and BHC. Reports are given at weekly vet meetings about these animals and their scores. Yellow animals are animals that have underwent a recent life change or medical change. Assessments are done on these animals and repeated based on their situations. Green animals are assessed yearly.

Animals receiving scores of "fair" or "poor" are required to have action plans in place and reassessment days scheduled on a shared calendar. Since the welfare assessments have started, several animals have had welfare scores increase due to keepers making changes to their husbandry and care. In addition, the welfare assessment has been a useful tool in making quality of life decisions for mourning dove to bull giraffe.

Conclusion

While many zoos strive to excel in behavioral husbandry there is a key component to this that has not been discussed. Culture and support from every level is critical to the program's success. This culture starts at the top with the CEO and President, Allen Monroe, understanding and supporting the behavioral husbandry brands. Down from there, the Director of Animal Care, RoxAnna Breitigan, understands the brands, budgets for, and provides support for the growth of the program. She continues to push and challenge the zoo to move forward through their training, enrichment, and welfare. Most importantly, the keepers understand this mission. They are willing participants to growing the getting behind the behavioral husbandry brands. Without this teamwork, the training and enrichment brands would be bankrupt. Culture and mission drives the successes, from the big corner office to the keeper's lockers.

Training for Euthanasia

Barbara Heidenreich

Barbara's Force Free Animal Training

www.BarbarasFFAT.com; www.AnimalTrainingFundamentals.com

Many behaviors we train result in improved animal welfare throughout the life of the animal. However, training for end of life is a conversation that is relatively new. Euthanasia is often emotionally challenging for animal caregivers. Even more difficult is to watch an animal experience stress in its final moments after a lifetime of training to otherwise cooperate. This can be addressed by including training for euthanasia in the behavioral repertoire. Even if an animal is trained for voluntary sedation, there are many details to consider to facilitate cooperation and high standards in welfare once the decision to euthanize has been made. These details include training for sedation, method for euthanasia, choosing and preparing the location, reactions to sedatives, addressing declining condition and more. Knowing what to expect, trainers can adapt shaping plans to minimize or eliminate stress. This presentation will discuss what trainers need to know to enable quality of life, even when passing.

The current typical process for humane euthanasia involves administration of a sedative, followed by administration of an injection (typically intravenously) to achieve cardiopulmonary arrest. This is because pain is considered to be a conscious experience. Other acceptable methods that do not produce pain involve direct physical disruption of brain activity such as captive bolt, electrocution, or bullet. These methods leave no drug residue in the body. This may be significant if after euthanasia the remains are to be used as a food source. For more detailed information on humane practices for euthanasia visit the American Veterinary Medical Associations Guidelines for Euthanasia <https://www.avma.org/KB/Policies/Documents/euthanasia.pdf>

Methods

Training for sedation via injection is an excellent goal towards reducing and eliminating stress associated with euthanasia. Often caregivers have trained for injection to allow for vaccinations and/or sedation throughout the animal's lifetime. Another route for sedatives to consider, especially for birds, is intranasally. In preparing for euthanasia there are also other factors to take into consideration.

An animal that may be declining in health or aging may have challenges moving. Training may need to be adjusted so that it is easy for the animal to get into position for administering sedatives. Jumping onto platforms or climbing onto stumps may no longer be an option.

Comfort may also need to be addressed. Aching joints may need soft surfaces. Traction or props to facilitate getting back up may be necessary for training sessions.

It can be helpful to build reinforcement history in the same location using the same props. Use targets and stations to train duration for the required body position in the desired location. These can be as simple as targeting a chin to a hand, towel or pillow. For birds, holding onto an anchored object as a target for duration facilitates intranasal medication training. For animals in protected contact, it may require hanging targets or using more than one person. There are any different shaping plans that can successfully teach animals to hold a specific position for duration. Train regularly in that location with familiar props and include other people if they will be a part of the process. For injection training, you will also want to confirm the gauge needle that will be used and the amount of fluid that will be injected. You will also need to know

where the sedative will be injected. However, if the animal has only been trained for subcutaneous injections vs intramuscular for example, the sedative can still be administered subcutaneously.

Also keep in mind that on the actual day of the procedure the animal may react to the sedative by becoming quite active and the movements may be erratic. The animal may also eliminate after the euthanasia drugs are administered. If props are required to address this (such as towels), it is recommended they are included in training sessions prior to the procedure if possible.

Familiar environments are less likely to be stress inducing. Or another option is to train the animal in advance to be comfortable with transport to the intended location for the procedure. In some cases, lower doses of sedatives can be administered prior to travel to reduce or eliminate potential stress in less familiar surroundings.

Another option is to generalize the behavior so that it can be presented in various locations either within the enclosure or elsewhere.

Sedatives can be injected intramuscularly, subcutaneously, intravenously, intranasally and/or given orally. In general sedatives given intravenously take effect the fastest, followed by intramuscular and intranasal, then subcutaneous, then oral. For some smaller species these sedatives may be followed by administration of inhaled anesthetics. This helps ensure deep sedation and allows for intracardiac injection if venipuncture is problematic due to the size of the species.

Whatever sedative option is chosen, there should be a plan for what happens after the sedative is administered. In many cases, sedatives take 10-20 minutes to take effect. Some animals can react adversely to sedatives and become more active. Others may move as the drugs take effect. This can be dangerous to people or other animals in the area. It can help to try to reduce environmental stimuli for these animals by covering eyes with a towel and placing cotton in the ears. Darkened or quiet rooms can be of help. This also means choosing locations wisely so that sedated animals do not wander into areas such as moats, ponds or inaccessible areas. Often choosing areas in which animals have limited choices to go are beneficial for larger potentially dangerous species.

Unlike sedation for surgery, this is one time in which food can be offered after the injection of a sedative. This can help address some of the restlessness that can occur after the injection. Some animals may respond well to a desired enrichment item to place focus, such as a Kong® stuffed with preferred food items. This can act as a distraction, but it may also have the undesired effect of causing the animal to fight the sedative to stay awake to remain engaged with the enrichment item.

Some animals may regurgitate food that is provided during this process, and as the sedative is taking effect. For this reason, it can be helpful to offer small pieces, fluid reinforcers (for example using blood for big cats) or something that can be licked.

Sometimes an oral sedative can be easily offered prior to the administration of the injectable sedative, however if the animal is quite stimulated this may not have an effect.

Euthanasia is essentially an overdose of sedatives and cardiopulmonary arrest medications. Therefore, precise calculations are not needed. But certainly, enough is needed which does mean knowing roughly how much medication will be administered. Therefore, it is helpful to have a general idea of the weight of the animal when possible.

Animals can resist sedatives. Sick animals may also not metabolize sedatives normally. Do still practice good safety protocols. Potentially dangerous animals should be trained with protective barriers and emergency contingencies should be in place. Ideally all injections can be delivered via protected contact for dangerous animals, however if that is not possible, sensitivity tests such as touching ears can help measure the effect of the sedative. Having safe easy access to these body parts is another component of setting up the training environment to consider.

Even if animals are not trained to fluency to voluntarily accept sedation, once the decision has been made to euthanize there are options for providing high standards in animal welfare and accomplishing the task effectively. If animals are receptive to food, it is a viable option to offer preferred food items throughout the process. Using logs or other enclosure furniture to create a chute, using injection poles rather than dart guns and offering oral sedatives all can help make it easier to get voluntary cooperation in a short

amount of time.

Feeding while injecting can be facilitated by offering very small pieces of food or delivering liquids or food items (such as nut butters or cream cheese) that require animals to remain in position to consume them. Offering large pieces of food often trigger animals to present undesired behaviors such as carrying food items to other locations to consume.

Consider creating comfortable places for animals to rest or hide that might give you easy access for injection. For example, place crates or boxes near accessible mesh. Make doors or cut outs in boxes to allow access. This antecedent arrangement can make it easy for the animal to give the required action without having to formally train for the desired position.

Setting up the environment to create the desired action is also helpful when an animal is not receptive to food. Non-food reinforcers may need to be considered such as scents, tactile, comfortable bedding, etc.

If an animal must be restrained for the initial sedative, use light restraint and observe how the animal responds to different types of restraint. For example, some birds may respond well to having their head restrained long enough to receive intranasal Midazolam. Whereas another bird may respond better to being wrapped in a towel for an injection in the pectoral muscle with its head free to move.

Although less commonly used in zoos and in the companion animal communities, captive bolt pistols also provide another option for euthanasia. These are typically used with cattle, sheep, pigs and other livestock. Their primary advantage is the lack of drug residue in the body which may then make it possible for the animal to be utilized as a food source for carnivores in the collection. They are considered humane due to their instantaneous and painless process.

Results

Copenhagen Zoo trained a domestic bull that was slated to be culled to hold position and allow the bolt pistol to be placed in the appropriate location for duration. This ensured the pistol was placed accurately for proper implementation of the procedure. There were many training sessions prior to euthanasia which made the actual day free of stress for the animal.

Discussion

Unfortunately, euthanasia is typically not easy for those of us who care for animals or share our lives with them. Animals that remain may need time with deceased companions. What they are experiencing is beyond the scope of this paper and each situation must be addressed on a case by case basis.

Humans who share deep bonds with animals will also process the experience in their own way. The inspiration for this training and paper was the unfortunate need to euthanize an animal companion suffering from cancer. Gathering knowledge about euthanasia, preparing the location for the procedure and training well in advance allowed him to experience a stress-free passing, a gift all animals deserve.

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Acknowledgements:

Special thanks to Annette Pedersen and Copenhagen Zoo for sharing examples of training for euthanasia.

Embrace the Bear

Utilizing Seasonality to Encourage Natural Behavior

Jessie McInelly
San Diego Zoo

In a wild, natural environment, animals are exposed to constant change and challenges that naturally encourage a full repertoire of behavior. Some of these behaviors are only seen in response to a specific season or seasonally available resource. In a zoological environment, these periodic shifts are often absent. A multitude of challenges; including infrastructure, a zoo's climate, and access to resources, can make it difficult for keepers to recreate these opportunities to thrive. The bear team at the San Diego Zoo has investigated and implemented many changes to our standard husbandry practices that allow us to draw out seasonal behaviors by replicating seasonal shifts and activities. This presentation will detail the process of investigating natural, seasonal behavior and replicating those opportunities for our animals in managed care.

One of the challenges of modern zoo keeping is creating opportunities for the animals in our care to express a full repertoire of species specific behavior. For animals on exhibit, the most common tool we use for encouraging behavior is enrichment. But standard enrichment practices are often item based, with the idea that we introduce a **thing** (ex. a scent, a boomer ball, a box) to elicit a **behavior** (ex. marking, playing, tearing). This method creates a dependence on keepers being the precursor to behavior, rather than environment.

In the wild, behavior is not based on a single precursor, but rather a variety of environmental inputs that are in constant flux. It is the **combination** of factors which gives animals a reason to behave.

Our bear team wanted to investigate options for introducing a similar combination of factors, creating an experience for the animal, and placing an emphasis on making the environment the precursor to a behavior, rather than the keeper.

Our initial focus uses Andean bears and grizzly bears as pilot species for the program. Most bears are housed in grotto-style exhibits, made mostly of concrete, with moat fronts and concrete walls. This creates lots of challenges associated with our exhibit spaces. The bones of the spaces have not been renovated since their original build dates, but over the years the exhibit spaces have gone through many overhauls to make improvements. From substrate and plants, to water features and complex perching designs, these changes have set the stage for increased behavioral diversity.

While these additions are huge improvements over what once was, the environments were still fairly stagnant, and we mostly relied on traditional enrichment practices of adding and removing items to encourage behavior.

The Basic Bear:

The first step to investigating seasonality was diving into natural history, the basics of what bears do and why. We wanted to know: In the wild, how do they spend their activity budgets? Where do they spend it? What influences them to make those choices? How do those factors change throughout the year?

We used a behavior flow chart was used to start breaking down components of behavior:

The charts end up producing a long list of behaviors, and multiple ideas of how to achieve those be-

haviors.

Seasonal Emphasis:

So, now we have an idea of what **behaviors** we are looking to encourage out of the animals. But how does that connect to **season**? Once we had a list of behaviors and ideas of how to elicit them, we categorized activities based on seasonal interest and importance. This required us to look back into our own observations of individual behavior over the years. We began to notice that just like in the wild, our animals showed more interest in certain food items, activities, and interactions depending on the time of year. This created an opportunity to target our program seasonally, focusing on emphasizing the things that are most important to the animal in any given season.

Based on this information, we started putting together bi-weekly schedules, emphasizing seasonally appropriate opportunities for behavior.

This is an example of a summer activity schedule for Andean Bears. This is a high energy time of the year, when bears would naturally be having to cover long distances to acquire increasingly lean food resources. We replicate this by placing an emphasis on exhibit rotation, getting animals to different spaces that encourage them to move and explore. Emphasis on scent enrichment and buried food items that require significant effort to acquire.

Now we have established what behaviors we are looking to elicit, and categorized those behaviors by seasonal emphasis. Now the fun part begins. One of the goals of the program is to remove keepers as a precursor to behavior, and instead have the environment cue the animal that there are seasonal resources available or activities to partake in. So now our challenge is, how do we create an environmental change to signal behavior?

Seasonal Habitat Use:

In the case of Andean Bears, our digging into natural history revealed that they move to starkly different habitats throughout the year in the pursuit of seasonally available resources. Each habitat has its own terrain challenges, weather, food sources, water sources, plant species, elevation, ect. By investigating each of these habitats we began to come up with ideas of how to change the zoo environment to mimic a wild one. We came up with a goal of changing the habitat quarterly. This means pulling out all of the old, and adding new substrates, new plants, new perching or other zoo ‘furniture’ if possible. Each season, the changes would be reflective of the habitat the bear would use at that time of year.

Example:

In the **spring**, we create a lush, forested habitat. Emphasis on deep, soil substrates, and lots of plants. The plants are tropical in nature, ferns, banana plants, hibiscus, ect.

In the **summer** we create a sparser habitat, with dry soils, sand, rock riverbeds and grasses and prickly shrubs.

By changing the physical environment, we set the stage for all of the other resources and activities to be emphasized in a given season.

Creating Weather in San Diego:

One of the elements that walks hand in hand with habitat change, is weather change. Each of the bi-climatic zones has its own range of weather that the animals would experience in a season. Rain/snow/temperatures might even be the cue to change from one area to another in pursuit of seasonal resources. One of the challenges of housing bears in San Diego is the fairly consistent weather year round. Sunny and 70 degrees is great if you are a keeper, but not so great if you are a bear, waiting on environmental cues to signal a behavior change.

We began to install items that allow us to artificially create weather events. Industrial fans to make wind, fog machines, sprinkler/mister systems to create a rainy day, and even snow or ice machines. These additions allow us to start to layer weather events with our seasonal environmental change:

In the **spring**, we provide a lush, forested habitat. Emphasis on deep, soil substrates, and lots of tropical plants. Days of a foggy environment, regular rain events.

In the **summer** we create a sparser habitat, with dry and sandy soils, rock riverbeds and grasses and prickly shrubs. Dry, windy breeze days.

Seasonal Diet:

Another element closely related to season is resource availability, diet being an easy one to manipulate. Wild bears eat very different diets throughout the year depending on what's available. Often this is not the case at a zoo, there is some variety, but it's often centered around a base diet that remains the same all year.

Instead of providing a base diet year round, seasonal diet changes (not just amounts, but TYPE) increase variety, behavior diversity, and fulfill the seasonal needs of those animals. For example, in the fall – grizzly bears are craving protein. Introduce more fish, carcass feeds, large salmon feeds. Remove items that are less important, such as greens.

One option we use for creating seasonality in diet is utilizing an **enrichment point** system: Enrichment 'points' is a small subset of the diet set aside for keeper discretion. Keepers can choose daily how to fill these point values, utilizing items off a master list.

We took the points list and sorted it into 'seasonal' items, based on availability and animal interest. Using this system, we only offer a subset of the items every season. Because items are no longer handed out year round we increase the value of those items when they become seasonally available. We can also pair items, like berries, to when they would be seasonally available for wild foraging, only offering them in the summer or early fall.

So with the changes to diet we add another layer to the experience:

In the **spring**, we provide a lush, forested habitat. Emphasis on deep, soil substrates, and lots of plants. Days of a foggy environment, regular rain events. Diet emphasis on fruit and eggs.

In the **summer** we create a sparser habitat, with dry and sandy soils, rocky riverbeds and grasses and prickly shrubs. Dry, windy breeze days. Diet emphasis on kibbles, dried fruits and small mammals.

Back to Behavior:

Now that the stage has been set for seasonal environment and seasonal diet, enrichment activities tailored to each season can make the most of the habitat and diet resources being offered. Using our enrichment calendar, every day becomes a fresh challenge, navigating season to season.

In the **spring**, we provide a lush, forested habitat. Emphasis on deep, soil substrates, and lots of plants. Days of a foggy environment, regular rain events. Diet emphasis on fruit and eggs. Enrichment challenges up high in perching, buried under deep substrates, emphasis on water based activities.

In the **summer** we create a sparser habitat, with dry and sandy soils, rocky riverbeds and grasses and prickly shrubs. Dry, windy breeze days. Diet emphasis on kibbles, dried fruits and small mammals. Scent emphasis, increased manipulative and visual challenges, social interaction.

Connecting the Influences:

Layering: seasonal habitat changes + seasonal 'weather' changes + seasonal diet changes + seasonal enrichment opportunities = increased behavioral diversity!

Once your seasons are established, you can also begin to utilize one resource or season to cue the transition to another resource or season. For example: Setting the stage of a fall to winter transition for griz-

zly bears. Fall weather cues the arrival of a seasonal protein resource such as carcass or salmon. These resources are available for a finite amount of time. As they start to dwindle we offer a transitional resource, such as enormous amounts of bedding, and we start to change to winter weather, creating a cue that encourages torpor behavior.

These are the combinations and transitions that start to create a natural flow of seasonal behavior. By replicating seasonal shift and seasonally appropriate experiences, we have a great opportunity to enrich our animals lives, and ultimately enhance animal welfare.

How Changing from Stockmanship to Positive Reinforcement With One Steer Led to Multiple Positive Program Changes and Staff Skill Development

Elise Dubuisson, Debbie Marrin, Amy Phelps

San Francisco Zoo and Gardens

Traditional handling practices for domestic livestock often involve the use of chutes, penning systems, hand restraint, and positive punishment. While these methods can achieve results, these practices may result in animals displaying fear or aggression towards their caretakers, which compromises animal welfare and staff safety. The San Francisco Zoo's Children's Zoo is home to a 1,000 pound steer, which historically exhibited undesirable behavior towards staff when walking between yards. The steer was originally managed using a halter with a chin chain that remained on him at all times. Through the use of positive reinforcement techniques, staff trained a behavior to put on and take off the halter daily, and then transitioned to a chain free halter. The steer was trained to walk voluntarily on lead so he could be safely moved between exhibit areas. Establishing a solid behavior foundation allowed training of more advanced medical husbandry behaviors, such as injections and hoof care. This was accomplished in protected contact, without the use of physical restraint or positive punishment. The steer has developed positive relationships with staff, and more readily interacts with enrichment. There were two primary trainers for this animal, a novice trainer and an experienced trainer who also functioned as a training mentor. Through the development of this training program both the novice trainer and animal were able to develop their skill sets together. This process supported the improved welfare of the steer, advanced staff professional development, and laid a foundation for advancing behavioral management programs throughout the Children's Zoo.

*Slider is an 8 year old steer that is a cross breed of Zebu (*Bos taurus indicus*), and Spanish Fighting Bull (*Bos taurus*). Slider was born with a congenital facial abnormality that caused him to have a twisted jaw, leaving him unable to nurse from his dam. He was therefore hand reared and kept as a family pet. Unfortunately, due to his size, and behavioral complications often associated with hand rearing, Slider was not a good fit for the rancher's family where there were many small children. He was donated to the San Francisco Zoo's Children's Zoo in 2014 at the age of three.*

At the time of his arrival to the Children's Zoo Slider was managed using traditional livestock and equine handling methods. He was not involved in any formal training program. As a hand reared animal, he displayed many behaviors that made management difficult and often times risky for staff. Slider often pushed people with his head, cornered people, and tried to knock animal staff over, most often during shifting between areas in the barnyard. As a result, he was placed in a traditional cattle halter which has a small chain that runs along the underside of the chin. The chain was viewed as an emergency safety mechanism. In the event that he exhibited those undesirable behaviors toward his handler, they were able to give the chain a slight tug and redirect his attention elsewhere, similar to traditional leash correction in dog training. The chin chain halter remained on him at all times as he would not allow staff to safely remove and apply it daily.

As part of his daily management, the steer was walked on lead between several different exhibit spaces. It was during these shifting procedures that the undesirable behaviors often occurred. To avoid these behaviors staff would set food in place ahead of time and then unclip the lead rope while in walk-

ing motion, releasing him to the food. This worked to distract the steer and avoid an opportunity to push or strike someone with his head, as long as the lead rope unclipped smoothly. If anything in the process of unclipping the lead led to staff having to slow or stop him it frequently led to undesirable behavior. He would then eventually be unclipped and released to the yard with fresh food, thereby reinforcing those unwanted behaviors.

One of Slider's daily exhibit locations was a small grass pasture space situated alongside a major employee service road. This resulted in many opportunities for non-animal staff to interact with Slider. As a hand reared animal he sought human attention and enjoyed tactile interaction, but would often get quickly over stimulated, and stick his head through the fencing slats, to push and strike his visitors. This further reinforced the development and persistence of this undesirable behavior.

Several preliminary goals were established to address Slider's behavioral challenges and improve his overall welfare. The first goal was to train a haltering behavior, so that the halter could be voluntarily applied and removed safely each day. This was done with the chin chain halter first since the steer was still exhibiting occasional undesirable behaviors while walking on lead. He was first trained to stand at a station when given the verbal cue, and was reinforced for placing his head through a specific opening in the fence line and maintaining position. The steer was then trained to remain still and allow staff to secure his halter. Moving locations in the barnyard was part of the reinforcement and motivation for Slider to allow haltering. Therefore it was instrumental to successful haltering that staff did not ever apply the halter until they were ready to shift him. The halter application became part of the cue to move. Once haltered, the lead rope was clipped into place and he was walked to the next exhibit area. Due to the history of striking or pushing staff, it was established that shifting the steer was to remain a two-person procedure and no one was permitted to move him alone. Certain mechanics of leading the steer were set so that all staff leading Slider were consistent. For example, he was always walked on the person's left side with a loose lead line. Additionally, the food was set and the doors open to the area he was moving into. This eliminated the triggers to past undesirable behavior such as the trainer stopping to unlock a gate, or releasing him into a corral that required refreshed food or enrichment. With consistent mechanics and clear expectations, Slider was successfully participating in application and removal of his halter daily and the undesirable behaviors while shifting were eliminated. At this time the chin chain halter was switched out for a full nylon halter, thereby removing the chin chain.

While working on the haltering and leading behaviors, staff simultaneously worked to expand the diversity of foods Slider would take by hand in order to support further training and behavioral development goals. While he would initially only take hay from trainers' hands, staff ultimately established a much more diverse reinforcement hierarchy including hay, carrots, fresh browse and edible weeds, and a variety of different brands and flavors of "horse cookies." With some new food items at the top of his hierarchy the team was able to start working towards more advanced husbandry behaviors. The additional training goals for the steer supported daily husbandry procedures as well as more advanced medical procedures. Additionally multiple behaviors were added that were not for management purposes, but for "fun." These behaviors provided mental stimulation and new learning challenges. The larger behavioral repertoire provided Slider more experience in "the game" of training and helped develop the skills necessary for training the more invasive and complex behaviors. Slider has now been trained to be a voluntary participant in his own daily care. He is worked by a small group of regular trainers with more "guest trainers" being added regularly to simulate veterinarians and other strangers that may need to touch or get close to him. His list of established behaviors includes the following:

Husbandry Behaviors	Training Game Behaviors
Nose Target (hand or buoy)	Turn
Station Behavior	Reverse Turn
Follow Behavior	Remote target to Cone
Back Up	Remote target to buoy
Chute Behavior	A to B
Line Up	Other side (for switching sides when grooming)
Fly Spray Application	
Full Body Tactile	
Hand Injection	
Wait	
Hoof and Dew Claw Trimming (hand tools and dremmel)	

After each structured training session Slider was offered a session which included tactiles and grooming. These were important to reinforce him for participating in training until released with the end of session cue, thereby ending training in a positive manner. These sessions, lasting on average 5 to 20 minutes each, further conditioned a positive emotional response to trainers, and strengthened his relationships with them. Slider learned to communicate to trainers which parts he wanted groomed or scratched through his body language and body part presentation. On warm days these sessions frequently ended with him lying down in the sun and receiving free contact massage and grooming. As a hand reared animal, human attention was very important to the steer, and we wanted him to be able to receive attention from additional staff and volunteers as well as his primary trainers. To provide Slider more human interactions and prevent instances of aggression staff established rules and guidelines for interactions with the steer. The rules and guidelines were posted on his corral on the back road setting Slider and his visitors up to succeed. The guidelines allowed for volunteers and staff to pet and brush him as that was particularly reinforcing for Slider, but required that if he were to put his head out between the fencing slats that they would stop scratching him and back away. In the past this was often where aggression was reinforced as he would push his head through and push people while they continued to scratch him and feed him. The guidelines also limited treats and other hand fed food items to structured training sessions.

To address the steer's immediate needs and further develop a larger set of behaviors the steer was assigned two primary trainers: one experienced trainer with over 40 years of experience, and one novice trainer with less than 5 years of experience. Slider's case created an opportunity to advance the skills of the animal as well as the knowledge of a novice trainer on the Children's Zoo team.

For the novice trainer, working with mentors was instrumental to her success and professional development as a trainer. Working with a trainer who was experienced in her field, side by side through every aspect of Slider's training, provided her a unique opportunity to learn. She was able to talk about management goals and how to shape behaviors to meet those goals. Writing training plans and participating in daily meetings were instrumental in the novice trainer's learning process. Through the process she learned the importance of flexibility and making good decisions within the training picture as challenges occurred. She

was able to see the importance of good communication amongst all who were involved and the impact it had on the overall success of the training. One of the most valuable parts of her experience was the ability to watch the mentor train. This enabled her to watch how the trainer's body language and bridge timing helped the animal to achieve the desired response, and thereby developed those skills within the novice trainer as well. The majority of training sessions were completed with both trainers present, allowing the mentor to provide timely and constructive feedback and coaching to the novice trainer. The teamwork insured consistency amongst trainers, and led to a positive learning environment for the entire team, human and animal alike.

Early stages of shaping new behaviors were carried out by the more experienced trainer and then passed over to the novice trainer. The novice was able to conduct training sessions alone and maintain behaviors at the set criteria. One of the core lessons learned was the importance of antecedal arrangements. It was another key to success to ensure the steer's corral was set with food and enrichment prior to shifting, the timing of training sessions was strategically placed in the daily routine, and the placement of training tools and props supported the behaviors being trained. Taking into consideration the whole picture of Slider's day set him and the trainers up to succeed.

As training progressed, the steer and the novice trainer both experienced a growth of confidence. The trainer was able to conduct training sessions with the ability to prevent undesirable behavior, and problem solve when the animal's behavioral responses was incorrect. The steer's trust in his trainers led to voluntary husbandry behaviors that were previously done only under restraint. His enthusiasm for training was loud and clear. He would vocalize loudly when he was impatient for training to start, and would leave full bags of hay in response to a recall cue to start a session. Seeing Slider have that kind of a positive emotional response was very rewarding to the team.

Working with the steer and a mentor was the catalyst that led the novice trainer to work with multiple animals and species within the children's zoo collection. With the support and mentorship of her curator the novice trainer was able to apply her newly improved skills to benefit additional animals. This included a geriatric quarter horse, two geriatric alpacas, two miniature donkeys, and a miniature horse. In her new position in the hoofstock department those skills have carried over to benefit the zoo's giraffe herd. Furthermore, this professional development will continue to extend its reach throughout her career, providing a better future for wildlife through improved behavior management.

As the novice trainer continues her journey as a lifelong learner, one of her biggest takeaways is that all animals, domestic or exotic have the ability to learn and willingly participate in their care as long as they have the tools given to them by their trainers. It is worth all of the time and effort to condition animals to participate voluntarily in management and medical behaviors to replace outdated traditional methods. Every species deserves the same efforts regardless of our ability to share space and eliminate choice as is often the fallback with domestic species. Though traditional methods may be effective and faster, the use of positive reinforcement techniques improves animal welfare. Additionally, positive relationships are built, reducing stress and the risk of injury to animals and staff. Most importantly, the animals' lives are enriched by the process!

Behavioral Effects of Classical Music on Shelter Dogs

J. Riha, S. Burk

Otterbein University Department of Equine Science

Animal shelters are often at full capacity nationwide, and canine behavior is a frequent concern for potential dog adopters. The objective of this research was to determine how classical music affects the behaviors of shelter dogs while in the presence of a human. Shelter dogs ($n=17$) were exposed to two days of classical music from 8 am-3 pm, and two days of no music. Dog behaviors were recorded at 3 pm on the second day of the treatment and control period. First, an evaluator stood silently six feet from the kennel for two minutes. Next, an evaluator stood in front of the kennel for 30 seconds, and then performed scripted interactions with the dog from outside of the kennel for 30 seconds. This was repeated in a visitation room with the dog off-leash. Wilcoxon signed-rank tests were performed to compare behavior frequency, duration, or intensity for the treatment and control periods. During the 2-minute observations, there was a trend for more yawning after music ($P=0.071$). When the evaluator provided attention outside of the kennel following music, dogs stood significantly less ($P=0.047$) and there was a trend for lower frequency of tail wagging ($P=0.058$) when compared to the control. When the evaluator ignored the dogs within the visitation room following music, the dogs displayed less intense tail wagging ($P=0.048$) and there was a trend of longer play behavior ($P=0.075$) when compared to the control. Overall, classical music did not appear to have a major impact on canine behavior following a two-day exposure.

Introduction

The number of animals in shelters remains high, with millions of dogs and cats housed in shelters each year. Behavior is a major reason for both surrender of dogs to shelters and euthanasia while in the shelter. According to a study by Salman and colleagues (2000), of dogs surrendered to shelters, 40% of owners cited at least one behavioral reason for the surrender. Behavior also plays a role in attractiveness of the dog for potential adopters, and some behaviors may lead adopters to overlook certain shelter dogs. Weiss and colleagues (2012) found that appearance, behavior with people, and personality/temperament were the most commonly cited reasons adopters provided for adopting a shelter dog. When asked about behaviors the adopted dogs exhibited, the most commonly reported behaviors were that the dog approached, licked jumped/climbed on the adopter, or wagged their tail. It is important to evaluate possible interventions that could improve behavior, and subsequently, reduce euthanasia and increase adoption rates.

Playing classical music in the shelter could be a simple intervention to improve dog behavior and reduce risk of euthanasia for animals because they exhibit poor or aggressive behavior. Music has shown a positive effect on stress levels in both humans and dogs. Khalfa et al. (2006) found that classical music decreased cortisol levels in humans following exposure to a stressor, compared to silence. Concurrently, Boone et al. (2003) found that when hospitalized dogs listened to a harp for 30 minutes, there was a decrease in respiratory rate and visual measures of the dogs' discomfort and restlessness when compared with controls. Kogan and colleagues (2012) found that kennelled dogs spent more time sleeping when classical music was played, compared to other music types or no music. However, it is unknown how music might affect canine interactions with humans.

The study aim was to determine if classical music played over two consecutive days affects shelter dog behavior while the dog is in the presence of a human. The presence of a human was meant to simulate the experience of having a human adopter observing or interacting with dogs in a shelter environment.

Methodology

This project was conducted in collaboration with CHA Animal Shelter and the Cleveland Animal Protective League. A total of 17 dogs (8 from CHA animal shelter and 9 from Cleveland Animal Protective League) were included in the study. Data were collected from August-December 2018. Before entering the study, background information (breed, age, history, intake date, and adoption date) was recorded for each dog. The mean age of the dogs was 3 ± 1.7 years and breeds included mixed breed, Labrador retriever, Rottweiler, American bulldog, and American pit bull terrier type. All dogs were housed at the shelter for a minimum of 5 days prior to entering the study to minimize effects of transitioning to the shelter.

An Amazon Echo device was set up within the kennel area at proper position so all dogs were able to hear the music at constant volume. A playlist of classical music was created using Pandora Premium. The playlist included various classical composers, such as Bach, Mozart, and Beethoven. The songs were shuffled and monitored via iPhone each day to avoid associations of song by time of day, and there were no advertisements or long pauses. Classical music was played from 8am to 3pm for two days. At 3 pm on the second day, the behavioral assessment was conducted immediately after the music was done playing. The dogs then went without any music for two days. The evaluator repeated the behavioral assessment at 3 pm on the second day of no music. The cycle was then repeated until 17 dogs were assessed.

The behavioral assessment consisted of three major parts. First, the evaluator stood six feet from the kennel, silently observing the dog's behavior for two minutes. The evaluator then stood directly in front of the kennel, ignoring the dog for 30 seconds, then giving scripted attention to the dog for another 30 seconds. The dog and evaluator would then go into a visitation room, where the evaluator would then ignore the dog for 30 seconds, then give scripted attention for 30 seconds. The same evaluator conducted all of the behavioral assessments.

Behavioral assessments were videotaped and the duration, frequency, and intensity of specific behaviors were recorded by the same evaluator. The following variables were recorded by duration (number of seconds the dog exhibited the behavior): walking, sitting, standing, laying down, tail between legs, ears pinned, ears alert, ears relaxed, playing, located at front of kennel, located at back of kennel. Frequency (number of times the dog exhibited the behavior) was recorded for tail wagging, barking, yawning, lip licking, growling. Tail wagging was also evaluated by intensity. Intensity was scored as a 0, 1, 2, or 3 based upon a combination of the frequency and duration of the wagging.

Wilcoxon signed-rank tests were conducted to compare behavior duration, frequency, or intensity following each condition (music or no music).

Results and Discussion

When the evaluator silently observed 6 feet from kennel, there was a trend for more yawning (Fig. 1) following music ($P = 0.071$). When the evaluator stood directly in front of the kennel, the dogs stood significantly less following music ($P = 0.047$). Also, there was a trend for a lower frequency of tail wagging when the evaluator gave attention to the dog in front of kennel, also following the playing of music ($P = 0.058$). While the dog and the evaluator were in the visitation room, there was less intense tail wagging following music when the evaluator ignored the dog ($P = 0.048$). There was a trend for longer play behavior following music as the evaluator ignored the dog ($P = 0.075$). No other trends or significant differences were noted for behaviors during these assessments.

Our results were conclusive with that of Bowman and colleagues (2017), stating that dogs spent less time standing after classical music had been played. This is similar to our finding of decreased standing time of the dogs following music when the evaluator stood in front of the kennel and gave the dog attention. It was also previously shown that increased sitting time can be associated with less time standing, so because our dogs showed more sitting following classical music, they were reducing their standing time, which could have led to reduced tail wagging.

According to Beerda and colleagues (1997), the amount of time dogs stands in a shelter can be directly related to their stress levels. Because the shelter dogs stood less, this implies that they may have been less stressed after classical music was played. Protopopova and colleagues (2014) found that after accounting for morphological preferences of adopters, dog behaviors that increased length of stay in the

shelter included facing away from the front of the enclosure, standing, and continual back and forth motion. If prospective owners see more positive behaviors when looking for a shelter dog, they may be more likely to adopt. With fewer dogs in a shelter at a given time because of higher adoption rates, the money shelters receive could be spent on ensuring the dogs have better quality enclosures, food, and enrichment.

Overall, few significant differences were identified when comparing canine behavior following classical music versus control. Future research should incorporate a longer treatment time and evaluations conducted while music is still playing. Playing classical music in a shelter environment is a simple intervention that could reduce the amount of time dogs spend standing in their kennels, and could lead to reduced time of stay in shelters.

Acknowledgements

I would like to thank Otterbein's Student Research Fund and 5 Cards for funding this project and making presenting at this conference possible. I would also like to thank CHA Animal Shelter and the Cleveland Animal Protective League for allowing me to use their facilities to conduct my research.

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Figures

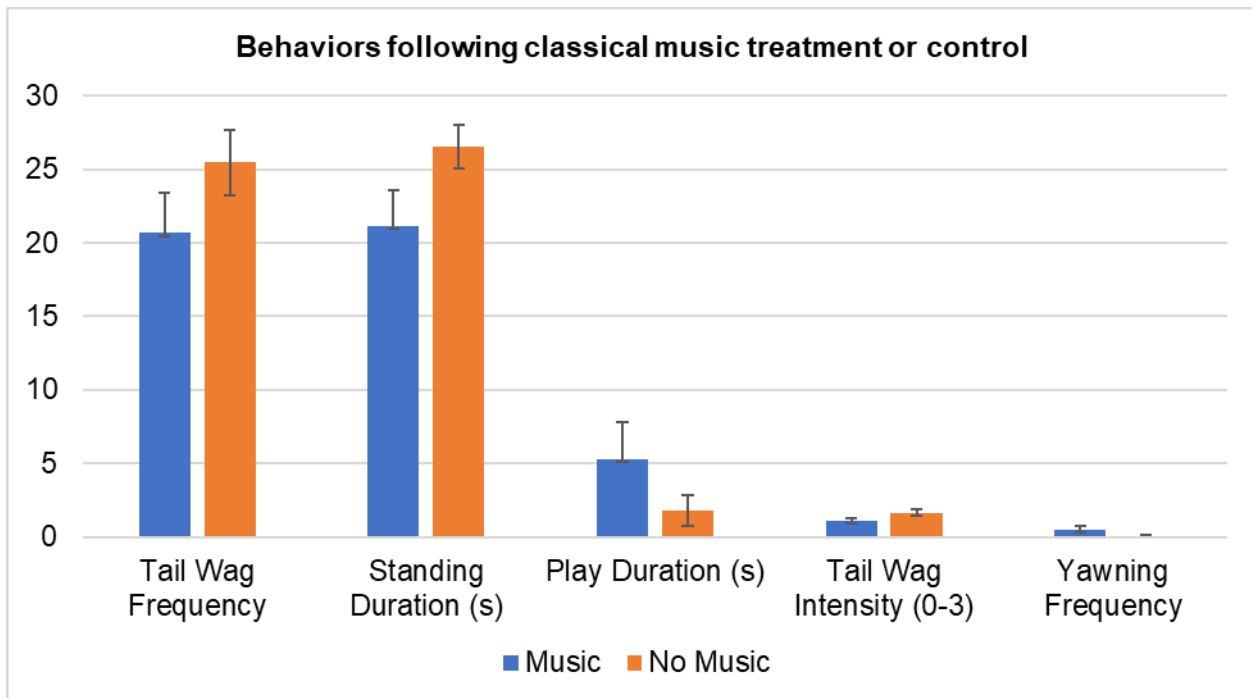


Figure 1. Frequency, duration, or intensity of behaviors following music treatment or control. *Indicates statistical significance at $P < 0.05$, otherwise $P < 0.1$.

The Effect of Grooming And Therapeutic Riding By Adolescents With Autism Spectrum Disorder on Equine Salivary Cortisol Concentrations

Burk, S., Kemeny, E., Gramlich, C., Hutchins, D., Shields, M.

Otterbein University Equine Science Department, Westerville, OH 43081

The use of horses in therapeutic riding programs, especially for children with autism spectrum disorder (ASD), has grown, yet little is known about the impact of grooming and riding on equine stress levels. This study compared equine salivary cortisol concentrations before and after grooming, therapeutic riding, and a control period. Saliva was collected at 4:00 pm and 4:30 pm from 10 horses used in a university therapeutic riding program. Samples were taken on two control days, before and after grooming on two days, and before and after two series of nine therapeutic riding lessons for adolescents with ASD. The samples were analyzed using an enzyme-linked immunosorbent assay (ELISA) to determine cortisol concentrations. The mean change in salivary cortisol concentrations over time for control, grooming, and riding was compared using one-way repeated measures ANOVA. Paired t-tests were used to compare the change over time for individual lessons and controls. No significant differences were found for the change over time during therapeutic riding, grooming, and control. A significant post-riding increase in salivary cortisol concentrations was found during lesson four when compared with controls ($P=0.02$). This was the first lesson focusing on walk-trot transitions, and the riders' balance and posture may have affected the horses. No significant increases in salivary cortisol were found during subsequent trot lessons. Overall, the data indicate that therapeutic riding and grooming had no significant effect on equine cortisol levels, suggesting that these human-animal interactions did not compromise the well-being of the horses.

Introduction:

In recent years, the therapeutic use of horses has become increasingly popular, and their use in therapeutic riding programs, especially for children with autism spectrum disorder (ASD), has grown. For children and adolescents with ASD, therapeutic riding has been demonstrated to result in improved sensory integration, directed attention, social motivation, and decreased sedentary behaviors (Bass et al., 2009), along with decreased irritability and hyperactivity (Gabriels et al. 2015). However, the exact impact of these lessons on the therapeutic riding horses is unknown.

One way to assess the impact of these lessons is to examine the cortisol levels of each animal. Cortisol is a hormone produced by the adrenal glands as part of the hypothalamic pituitary axis (HPA), and cortisol concentrations found in both blood and saliva can be used to determine how stressed the animal is (Möstl & Palme, 2002). It is known that in equines, salivary cortisol levels fluctuate during the day due to a natural circadian rhythm and salivary cortisol concentrations are typically highest around 10:00am (Bohák et al., 2013). Moderate to intense exercise also has been found to increase blood cortisol levels in horses (Kędzierski et al., 2013); however, further study is needed to understand more about how therapeutic riding, which typically involves low intensity exercise, affects salivary cortisol. Fazio and colleagues (2013) found that blood cortisol concentrations were lower in horses following participation in therapeutic riding lessons for riders with varying psychomotor disabilities when compared with recreational lessons for riders without disabilities. The same routine and exercise intensity were followed for riders in both of those groups. In another study, frequency of equine stress-related behaviors was significantly higher when ridden by at-risk children, whereas there was no difference in equine stress-related behaviors when ridden by recreational riders without disabilities, riders with physical disabilities, or riders with developmental delay or mental health

diagnoses (Kaiser et al. 2006).

The horses used in therapeutic lessons, and domestic horses in general, are often groomed daily, and this is a procedure typically conducted before and after riding. Grooming is assumed to be a fairly calming activity that must be done in order to ensure the welfare of the animal. In dogs housed in animal shelters, 25-minute human contact/exercise sessions were shown to reduce salivary cortisol (Menor-Campos et al. 2011), while grooming, petting, and practice of obedience commands for 45 minutes resulted in either decreased salivary cortisol or no change, depending upon the number of days after the dog's arrival (Coppola et al. 2006). However, a search of the literature did not reveal any studies conducted to investigate the impact of this common daily activity on the stress levels of the horse.

Knowledge of how grooming and therapeutic riding affect HPA activity and cortisol production in the horse will allow directors of therapeutic riding programs and horse owners in general to be able to make the best decisions concerning the welfare of their animals. The aim of this study was to compare the effects of both grooming and therapeutic riding on salivary cortisol concentrations of 10 horses used in a university therapeutic riding program designed for adolescents with ASD.

Methods:

This study was conducted using 10 horses who actively participate in a therapeutic riding program at Slippery Rock University. On each collection date, samples were collected at 4:00 pm (designated "pre") and 4:30 pm (designated "post") to account for any fluctuations due to the horses' natural circadian rhythms. The horses did not have access to hay or feed within 60 minutes prior to sampling to avoid affecting baseline cortisol levels. Samples were taken before (pre) and after (post) a control period, grooming, or therapeutic riding.

Samples were taken on two control days when horses were not used for any other activities. During these control dates, horses remained in their stalls between the pre and post sampling times. Grooming samples were taken from each horse on two days when the horse was not used for riding or other activities. Grooming samples were collected over a period of four days total to avoid sampling on any dates when a horse was needed for lessons, but each individual horse was only sampled on two dates. On grooming sampling days, each horse was groomed in a cross-tie area for a total of 30 minutes using a set grooming protocol by experienced volunteers or student workers. The same grooming protocol was followed for all horses. Each horse had its hooves picked for 5 minutes, and then was curried for ten minutes with a rubber curry. Next, each horse was brushed for 5 minutes using a stiff-bristled body brush, and then for an additional 5 minutes using a soft-bristled body brush. The volunteers gently combed the horses' manes and tails for the remaining 5 minutes.

The riding samples were taken over the course of two nine week lesson periods (for a total of 18 lessons) prior to the control and grooming sampling dates. One lesson and thus one pre and post lesson sampling occurred each week. On riding sampling days, horses were ridden by adolescents with ASD and the instructor followed a set 30-minute lesson plan. A series of nine different lesson plans including a progression of riding skills was used. The lesson plans were repeated in the second lesson period, but the horses were ridden by a different group of riders with ASD. Lesson content included posture and walk-halt-walk transitions (week 1), basic steering and backing (week 2), neck reining, walking over poles, and trotting introduction (week 3), walk-trot-walk transitions and steering around cones (week 4), two point and steering (week 5), riding without stirrups at the walk and trotting a 20-meter circle (week 6), independent riding at the trot and leg yield (week 7), independent riding and collected/extended trot (week 8), and mock horse show (week 9).

During each saliva collection, a swab (Salimetrics) was placed under the tongue of each horse for 60 seconds. The swab was then deposited into a sample tube and stored at -20°C until ready for analysis. The samples were analyzed using an ELISA kit (Salimetrics) designed to estimate salivary cortisol concentrations. To analyze cortisol concentrations, samples were first thawed and centrifuged for 15 minutes at 1500Xg. Once samples had been thawed, centrifuged, and pipetted into each well, assay reagents were added and each plate was read using an absorbance microplate reader (eMax Plus, Molecular Devices). Each assay contained standards, high, and low controls, and a zero control. The samples themselves were run in duplicate and analyzed for any internal deviations. The mean change in salivary cortisol concentra-

tions over time (pre-post) for control, grooming, and riding samples were compared using one-way repeated measures ANOVA. Paired t-tests were used to compare the change over time, from 4:00-4:30 pm, for individual lessons and controls. Statistical significance was set at $P < 0.05$.

Results and Discussion:

Mean Equine Salivary Cortisol Concentrations:

The mean equine salivary cortisol concentration pre-grooming was 0.071 ± 0.009 $\mu\text{g/dL}$ and 0.058 ± 0.007 $\mu\text{g/dL}$ post-grooming (Fig. 1). The mean salivary cortisol concentration pre-therapeutic riding was 0.096 ± 0.007 $\mu\text{g/dL}$ and post-therapeutic riding was 0.114 ± 0.008 $\mu\text{g/dL}$. The mean control salivary cortisol concentration at 4:00 pm (pre) was 0.085 ± 0.020 $\mu\text{g/dL}$ and 0.096 ± 0.029 $\mu\text{g/dL}$ at 4:30 pm (post). No significant differences were found for the change in salivary cortisol concentration over time when comparing therapeutic riding, grooming, and control (Fig 1).

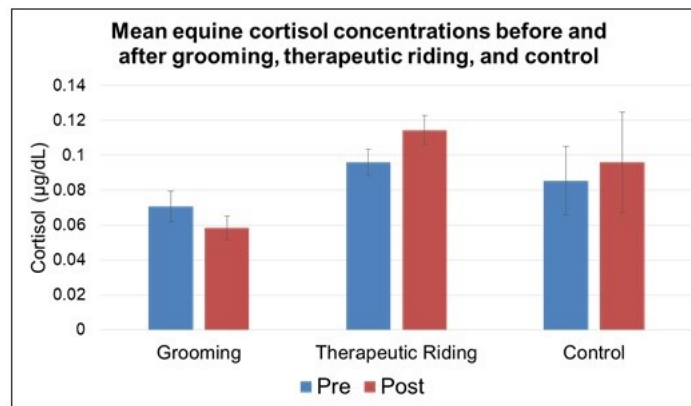


Figure 1: The mean equine cortisol concentrations with standard error bars are shown before (pre) and after (post) control, grooming, and therapeutic riding.

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Change in Mean Equine Salivary Cortisol in Response to Therapeutic Lessons:

The change (pre-post) in mean equine salivary cortisol levels in response to each lesson was as follows (Fig 2.). Lesson 1: 0.018 ± 0.011 $\mu\text{g/dL}$; Lesson 2: 0.021 ± 0.034 $\mu\text{g/dL}$; Lesson 3: -0.038 ± 0.054 $\mu\text{g/dL}$; Lesson 4: -0.134 ± 0.043 $\mu\text{g/dL}$; Lesson 5: 0.017 ± 0.014 $\mu\text{g/dL}$; Lesson 6: -0.00035 ± 0.018 $\mu\text{g/dL}$; Lesson 7: 0.020 ± 0.009 $\mu\text{g/dL}$; Lesson 8: -0.0042 ± 0.012 $\mu\text{g/dL}$; Lesson 9: -0.030 ± 0.013 $\mu\text{g/dL}$. The mean change in control cortisol concentration was -0.011 ± 0.011 $\mu\text{g/dL}$.

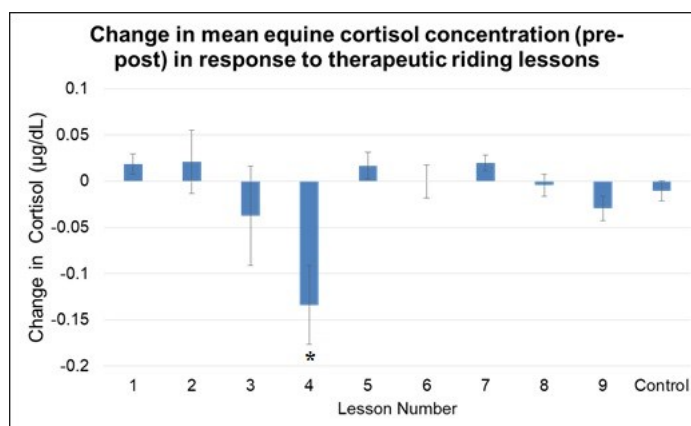


Figure 2: The change in mean equine salivary cortisol concentration (pre-post) over nine lessons is shown with standard error bars. *Indicates $P < 0.05$ when compared with control.

Figure 2: The change in mean equine salivary cortisol concentration (pre-post) over nine lessons is shown with standard error bars. *Indicates $P < 0.05$ when compared with control.

When analyzing the individual lessons (Fig. 2), a significant post-riding increase in salivary cortisol concentrations was found during lesson four when compared with the control ($P = 0.02$). Lesson three was the first lesson the students were introduced to trotting and lesson four was focused on walk-trot transitions. It is possible that compromised rider balance and position during the walk-trot transitions led to the increased equine salivary cortisol concentrations. Although moderate to intense exercise is known to increase salivary cortisol concentrations, no significant increases in salivary cortisol were found during subsequent trot lessons, so it is not likely that the increase in cortisol concentration was solely due to the introduction of trot work. Salivary cortisol concentrations pre and post grooming were not significantly different from the control concentrations, indicating that this activity was not stressful to the horses. In contrast, during another common equine procedure, Yarnell and colleagues (2013) found an increase in salivary cortisol in both compliant and non-compliant horses following ten minutes of body clipping. Although grooming had no overall effect on salivary cortisol, it would be worth investigating other common equine management practices to determine the effect these activities have on equine salivary cortisol levels.

Conclusion:

Overall there was an increase in salivary cortisol concentration following lesson four, indicating the horses may have been stressed during this beginner trot lesson. Therapeutic riding instructors should ensure adequate rider skill competency and readiness prior to early trot lessons. Otherwise, the data indicate that therapeutic riding and grooming had little effect on equine cortisol levels, suggesting that these human-animal interactions did not compromise the well-being of the horses.

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