The Journal of the American Association of Zoo Keepers, Inc.

# Animal Keepers' Forum

July 2025, Volume 52, No. 7

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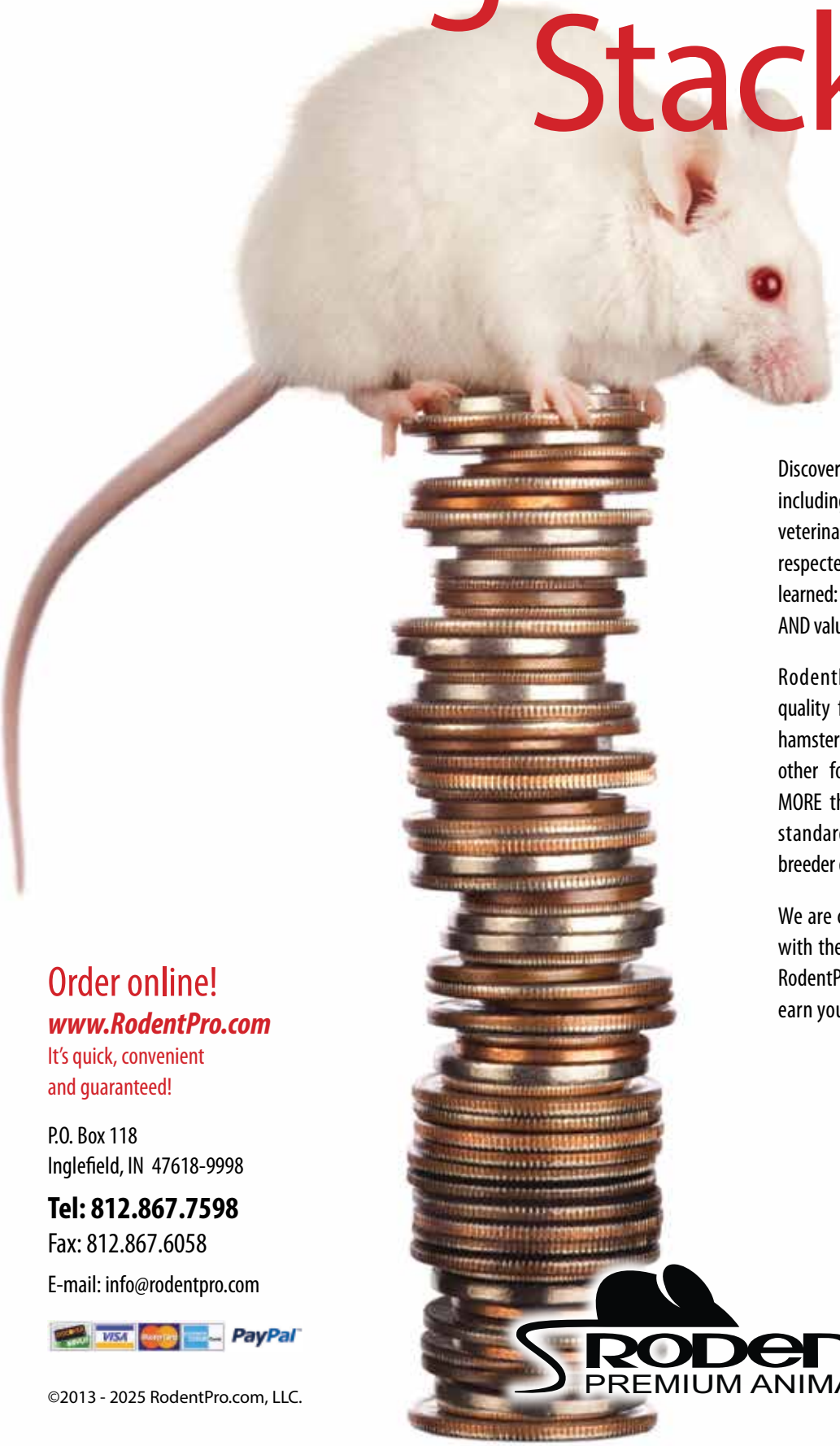

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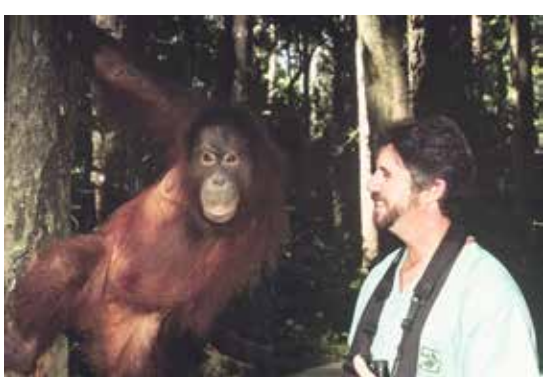

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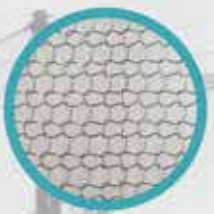

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The American Association of Zoo Keepers, Inc. exists to advance excellence in the animal keeping profession, foster effective communication beneficial to animal care, support deserving conservation projects, and promote the preservation of our natural resources and animal life.

## ABOUT THE COVER

This month's cover photo comes to us from Adam Thompson of Zoo Atlanta and features 3.0 Western lowland gorillas *(Gorilla gorilla gorilla)*. There are two species of gorilla, each containing two subspecies. The two species are eastern and western, and the four sub-species are Cross River and Western Lowland (are sub-species of the Western species) and Grauer's and Mountain (are sub-species of the Eastern species). Western gorillas can be distinguished from other gorilla subspecies by their brownish-gray hair, auburn-colored crests and overall smaller size. Gorillas are the largest of all primates and reach physical maturity between 12 and 15 years of age. Males can be between 350 and 450 pounds, almost twice as much as females, weighing in between 150 and 250 pounds. Males stand between 5.5 to 6 feet tall. Females are a bit smaller, standing between 4'7" to 4'11". The males' heads are large and pointed due to the sagittal crest that forms the back of the top of the head. This crest serves as the foundation for attachment of a great number of jaw muscle fibers, which allows for the chewing power needed to process tough vegetation. The range of Western lowland gorillas includes the rainforests of central and western Africa, including the nations of Angola, Cameroon, Central African Republic, Democratic Republic of Congo, Gabon and Equatorial Guinea. Western lowland gorillas prefer the tall, lush tropical forest of west and central Africa. The herbs, shrubs and vines that make up its diet grow best where the open canopy allows plenty of light to reach the forest floor. (https://zooatlanta.org/animal/western-lowland-gorilla/)

Articles sent to **Animal Keepers' Forum** will be reviewed by the editorial staff for publication. Articles of a research or technical nature will be submitted to one or more of the zoo professionals who serve as referees for **AKF**. No commitment is made to the author, but an effort will be made to publish articles as soon as possible. Lengthy articles may be separated into monthly installments at the discretion of the Editor. The Editor reserves the right to edit material without consultation unless approval is requested in writing by the author. Materials submitted will not be returned unless accompanied by a stamped, self-addressed, appropriately-sized envelope. Telephone, fax or e-mail contributions of late-breaking news or last-minute insertions are accepted as space allows. E-mail shane.good@aazk.org for more information. If you have questions about submission guidelines, please contact the Editor. Submission guidelines are also found at: aazk.org/akf-submission-guidelines/.

The deadline for each regular issue is the 3rd of the preceding month. Dedicated issues may have separate deadline dates and will be noted by the Editor.

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SARAH SNIDER-KEYS
AAZK BOARD MEMBER
CONNECTIONS OVERSIGHT

## Hello AAZK Membership!

It is hard to believe, but it's already July and that means that National Zoo Keeper Week (NZKW) is upon us! Each year in July this week is filled with recognition that highlights the hard work that keepers do every day for the animals in their care and serves as an opportunity to educate the public about what that work entails.

As you might see, there are a few updates and changes this year for NZKW:

The committee has decided to forgo having a specific theme for NZKW this year. Although there is no overall theme, the NZKW committee has created new selfie papers, digit cards, word clouds, and an events and programs idea sheet in the planning packet for Chapters and keepers to use to help celebrate and educate! This allows for each Chapter to drum up different ideas and themes that engage their community and is specific to their Chapter's interests!

Additionally, the National Zoo Keeper Week committee is excited to share that the postcard exchange is expanding to include AAZK's Latin American membership! The postcard exchange is a fun and simple way to connect with other keepers across the country and now, in Latin America! If you missed out on this year's postcard exchange, be sure to sign up for next year by e-mailing NZKW@aazk.org by June 2026.

If you and your Chapter or zoo have a fun and unique way of celebrating NZKW, don't forget to share it using this year's hashtags: #NZKW2025, #ImAKeeper, #AAZKNZKW and let the NZKW and Communications committees know about it!

We hope you have a great week celebrating and educating!

Cheers,

**Sarah Snider-Keys**

# UPCOMING EVENTS

**July 19, 2025 - July 25, 2025**
**AZA Felid Taxon Advisory Group**
Conference and Husbandry Courses
All-Day Event
Hilton at Short Hills, NJ
www.aza.org/calendar

**August 11, 2025 - August 15, 2025**
**2025 Bear Husbandry Course**
All-Day Event
Memphis Zoo | - Memphis, TN
www.aza.org/calendar

**September 1-5, 2025**
**Giraffe Care Workshop**
Hosted by the International Center for the Care & Conservation of GiraffeA
Cheyenne Mountain Zoo
Colorado Springs, CO
giraffecenter.cmzoo.orgA

**September 13-18, 2025**
**2025 AZA Annual Conference**
Hosted by The Florida Aquarium, ZooTampa at Lowry Park, and Busch Gardens Tampa Bay, Tampa, FL
www.aza.org/calendar

**October 5-9, 2025**
**50th Annual AAZK National Conference**
Phoenix, Arizona
www.aazkphoenix2025.com

**SUBMIT YOUR EVENTS TO SHANE GOOD AT SHANE.GOOD@AAZK.ORG.**

# THERAPEUTIC METHODS FOR A JERSEY COW WITH SPINAL ABNORMALITIES

BROOK GOULET, KEEPER I[1], ANNE POLING, ZOOLOGICAL CARE SPECIALIST III[2], AND SARAH COLMAN, CURATOR I
SAGINAW CHILDREN'S ZOO[1] AND FRESNO CHAFFEE ZOO[2]
SAGINAW, MI[1] AND FRESNO, CALIFORNIA[2]

## INTRODUCTION

Prescott, a Jersey calf, was donated to the Saginaw Children's Zoo in 2018 by Pro-Hart Jersey Farm. He was born with congenital abnormalities that the farm did not feel they could manage, but their hope was that his story of coming to live at the zoo would inspire kindness, empathy, and understanding in zoo guests for animals with physical disabilities. Upon examination at the zoo he was diagnosed with scoliosis, an abnormal lateral curvature of the spine, and kyphosis, a forward curvature of the thoracic spine measuring greater than 50 degrees. These abnormalities caused Prescott to have difficulties balancing while standing, an abnormal gait that manifested as dragging his rear right hoof while walking, periodic swelling of the rear right fetlock, and decreased flexibility in the neck, back, and legs. These problems only worsened as he grew, at which point the Animal Care team began collaborating with multiple veterinarians to formulate a multi-faceted care plan for Prescott.

The Zoo's veterinarian, curator, and Prescott's caretakers discussed the observable difficulties Prescott experienced from his spinal conditions and decided that an approach combining nutrition, medical treatment, and therapeutic methods would be used to improve Prescott's quality of life. The following goals were discussed:

1. Improving Prescott's balance to prevent falls and make lying down and standing up easier.
2. Increasing flexibility of Prescott's neck and back to make grooming himself easier.
3. Reducing the stiffness of Prescott's back and legs to give more freedom of movement when walking, reduce tripping, and reduce dragging of right rear leg.
4. Decrease swelling and tenderness of right rear fetlock to increase overall comfort.

The zoo team decided that the Zoo's veterinarian would manage Prescott's nutrition and the implementation of medications, the curator would source and coordinate outside therapists with consultation from the veterinarian and assist with therapies as needed, and Prescott's caretakers would provide his daily care and therapies as directed.

The first thing to accomplish with Prescott's case was finding practitioners who were willing to work on a cow. While there are many excellent veterinarians specializing in a wide range of therapies in the Michigan area, most were not willing to use these techniques on a cow, or did not have availability to assist with his case. After discussing Prescott's case with many veterinarians that provide equine and/or canine therapy, we ended up with three skilled veterinarians who worked with us to provide Prescott a full suite of therapeutic services, tirelessly driving out to the zoo on a regular basis for eight months to provide treatment.

Prescott was handled often from a very young age, making him extremely tractable and friendly, which meant many therapies were available for us to try. After consultation with the curator, the Zoo's veterinarian, and our three therapists, we decided on the following treatments: acupuncture, therapeutic massage, cold laser therapy, veterinary spinal manipulative therapy (VSMT), targeted pulsed electromagnetic field therapy in the form of an Assisi Loop® device, neck stretching exercises, and balancing exercises. Medical treatments and supplements utilized were Adequan®

Photo 1: Prescott receiving veterinary spinal manipulation therapy (VSMT) for the first time in May 2019. Note the stiff and rigid neck held straight and very low. Prescott was unable to raise his head to shoulder height or turn it side to side.

intramuscular injection, and DuMOR® Flexmor Advanced Joint Supplement. Prescott began receiving his therapeutic treatments on 10 May 2019.

## MATERIALS AND METHODS

The first therapeutic method used to treat Prescott was veterinary spinal manipulative therapy (VSMT), also known as animal chiropractic. This therapy was provided by two different certified practitioners who alternated weeks, so Prescott was able to have one session per week, lasting 30-45 minutes per session. Upon identifying restricted joints in Prescott's spine, shoulders, and hips, the therapists would correct them with adjustments, which are specific and gentle thrusts into the affected joints. Any areas that were adjusted would be palpated to ensure that the joint was moving more freely. Chiropractic adjustments like this work to restore range of motion in restricted joints, alleviating swelling and pressure on the surrounding nerves and soft tissue. Restoring range of motion allows for healthier ambulation and neuromuscular function while the reduction of swelling allows for better communication between the nerves and brain (Young, 2021). VSMT has been successfully utilized in horses, which is why it was chosen as a therapeutic treatment for Prescott (Photo 1).

The next therapeutic method utilized in Prescott's treatment was cold laser therapy, also known as low level laser therapy. This was performed by two different practitioners at least twice per month, with sessions lasting up to 25 minutes. The laser was applied along Prescott's spine, around his shoulders and hips, and on his rear right fetlock (Photo 2). The laser emits low levels of red and near infrared light to relieve pain, inflammation, and swelling. One way the laser is thought to relieve inflammation and swelling is by causing "vasodilation by triggering the relaxation of smooth muscle associated with endothelium, which is highly relevant to the treatment of joint inflammation" (Pietrangelo, 2019). It is also thought to act on mitochondria within cells to trigger processes that can help reduce inflammation (Chung et al, 2012). Additionally, this type of therapy has been proven effective in alleviating pain and in treating chronic joint disorders.

Another therapeutic method that was included as a part of Prescott's treatment plan was acupuncture. This was done by two different practitioners, with a total of two sessions per month. The acupuncture needles were placed

Photo 2: Prescott receiving cold laser therapy in June 2019.

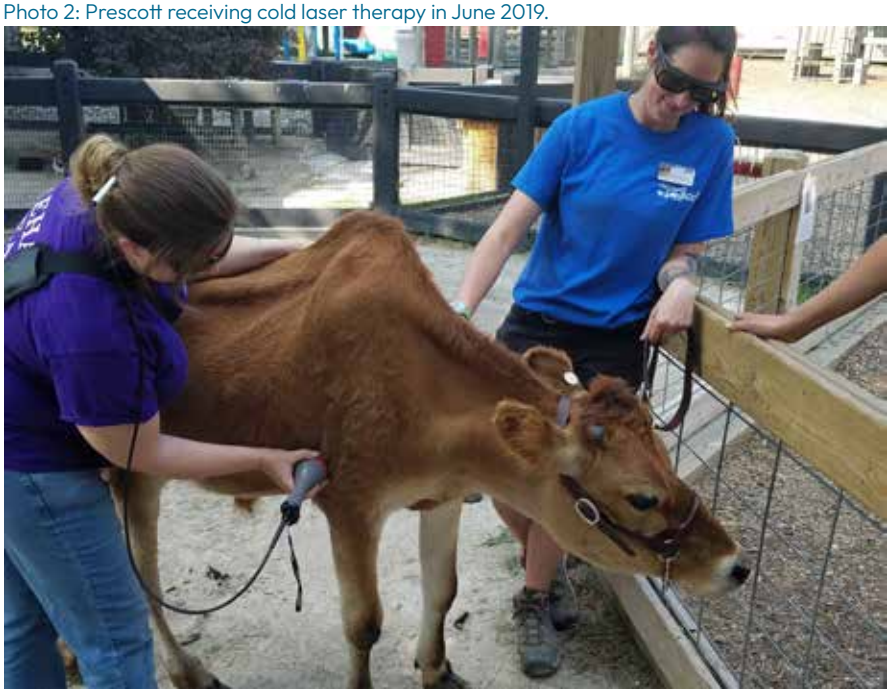

Photo 3: Prescott enjoying hay during an acupuncture session in July 2019.

on points along Prescott's spine, shoulders, and hips (Photo 3). These points, known as acupuncture points, contain groupings of nerves, muscles, and connective tissue. Stimulating these areas with the insertion of needles leads to increased blood flow which can activate the body's natural pain relievers (Buzhardt, 2022). The malformations of Prescott's spine were thought to cause chronic pain, so a therapy that was focused on pain relief was an important part in his treatment plan.

An additional therapeutic method that was used for Prescott's treatment was targeted pulsed electromagnetic field therapy in the form of an Assisi Loop® device. This device was donated by one of the therapists and used several times per week by Prescott's caretakers. The Assisi Loop® delivers a microcurrent to damaged tissue to trigger the body's natural anti-inflammatory process, producing nitric oxide. Nitric oxide in the body is thought to induce vasodilation in the cardiovascular system which assists inflammation by facilitating the delivery of oxygen and nutrients to the damaged area (Evans, 1995). Keepers used the Assisi Loop® on Prescott's spine, shoulders, hips, and rear right fetlock to help with swelling and inflammation in these areas. As the device is non-invasive and easy to use, it was an effective tool in allowing animal care staff to continue Prescott's treatment on a more regular basis. The loop could be secured to Prescott with an elastic bandage and left on for up to 15 minutes, allowing Prescott to walk around, eat, and interact with enrichment while receiving treatment.

One other therapeutic treatment provided to Prescott was therapeutic massage. Therapists visited to perform massage twice per month and instructed caretakers in basic massage techniques so that Prescott could receive therapeutic massage in between scheduled therapy visits. Caretakers were able to perform massage daily on Prescott's back, shoulders, hips, and rear legs. Therapeutic massage is effective in increasing circulation, reducing muscle pain/spasms, and relieving tension. Due to the abnormal shape of Prescott's spine, many of his muscles were strained and very tight, either from being pulled too far or from being cramped. Therapeutic massage was considered an ideal treatment for Prescott to help relieve this strain.

The final therapeutic components of Prescott's treatment plan were neck stretches and balance exercises. Prescott's neck was especially rigid so caretakers would use hay to encourage him to move his head from side to side, and up and down, to stretch and soften the neck muscles. Caretakers would also gently sway him from side to side by placing their hand flat on his back and slightly pushing to either side while supporting him to prevent falling. This helped him exercise and strengthen his back and leg muscles to improve balance. Due to his spinal curvatures, Prescott often had a challenging time stabilizing himself while standing, and while walking he would slightly drag his right rear hoof behind him. By supporting him while swaying him from side to side, this helped him develop the muscles he needed to stabilize himself. These exercises were both prescribed by his therapists to increase his range of motion, improve balance, and improve neuromuscular functioning.

In addition to multiple therapies, Prescott was also treated with medication and supplements. He was prescribed 1.6 ml Adequan®, injected intramuscularly every four days, and one tablespoon of DuMor® joint supplement, offered every day. Adequan® is the only FDA-approved equine intramuscular treatment for degenerative joint disease. It reduces inflammation, restores joint lubrication, and repairs joint cartilage. The DuMor® joint supplement contained glucosamine, chondroitin, and hyaluronic acid, components of cartilage and joint fluid. Glucosamine and chondroitin taken together are thought to slow the degradation of cartilage, and hyaluronic acid supplements can slow the degradation of cartilage and even promote its regeneration (Duchant et al., 2005; Migliore and Procopio, 2015). With the malformations of Prescott's spine, he was already beginning to show signs of suffering from osteoarthritis and had joints that were directly affected by his spinal curvature.

Photo 4: Prescott receiving cold laser therapy in August 2019. Note the difference from May 2019 in neck posture, flexibility, and higher head carriage.

## RESULTS

The day after his first therapy session on 10 May 2019, it was observed that Prescott was moving around more freely and easily and his neck felt less stiff.

On 7 June 2019, the therapist reported that Prescott's back was easier to adjust, and she was able to get movement in his vertebrae and shoulders that had not been possible at the initial session. She also noted that he was lifting his rear legs higher while walking than he had at the start of treatment. Additionally, he was able to step side to side and backwards while maintaining his balance, which he had been unable to do before starting treatment.

Over the next few months, caretakers observed that Prescott had more mobility and range of motion in his neck. He was able to turn his head to groom his sides and lower his head to groom his front legs, which he had not been able to do previously. His gait also improved, with his right rear leg dragging less and all his legs lifting higher when he walked, rather than being held stiffly and swung to the side. Prescott's overall activity level and exercise tolerance also increased, with caretakers observing him trotting, running, and even bucking during play, which had never been observed prior to starting therapy.

An improvement was seen in his balance as evidenced by his ability to receive hoof trims from the farrier. The first few times Prescott had his hooves trimmed due to uneven wear caused by his abnormal gait, he needed to lean against a fence, or some other support, and the farrier was only able to pick up his front hooves without Prescott losing his balance. On a visit from the farrier on 16 August 2019, Prescott was able to keep his balance while all four hooves were picked up and trimmed with only a little support from the keeper when the rear right hoof was trimmed.

Prescott's overall posture noticeably improved over the months he received therapy. When he started therapy, his posture was usually to stand with his head extended stiffly out at chest level, without much movement as his neck and shoulder muscles were quite rigid. Over the course of receiving therapy, Prescott began to hold his head higher, closer to shoulder level, and was much more relaxed. His head also moved more loosely when he moved around, rather than being held stiffly forward all the time (Photo 4). When standing he could stretch his nose upward and turn his head to look behind him as well, which he was unable to do prior to therapy.

## CONCLUSIONS

In the eight months Prescott was on his care plan, he showed great improvement in mobility, range of motion in his neck, flexibility, balance, and posture. Upon review of our goals for Prescott's care plan, all goals appeared to have been met, with the additional result of improved, relaxed posture being observed in addition to our stated goals. It is our conclusion that Prescott's care plan was successful and improved his quality of life. Unfortunately, as all the therapy methods were started at roughly the same time it is difficult to discern if any one therapy had more of an impact than the others.

Prescott did learn to recognize his therapists and approached when he saw them arrive, so we hypothesize that he found his interactions with them positive. He tolerated acupuncture best if he was given hay to eat during treatment, but he did not need food to cooperate for other therapy methods, tactile reinforcement was sufficient, although hay was always offered. He was always especially relaxed during his VSMT, massage, and cold laser treatments and would follow his therapists once the treatment was completed, which we interpreted as him finding the treatment and interaction with his therapists reinforcing.

Only eight months after beginning his treatment plan, Prescott suffered a catastrophic injury to his right rear leg that left him unable to support himself and prognosis for healing was poor. Prescott was humanely euthanized on 17 January 2020.

Due to the short amount of time data were collected on his treatment plan, it is difficult to say how the therapies would have impacted him long-term, especially as he became a fully-grown adult. However, the progress he made during the eight months he received treatment does seem to indicate that these therapies were beneficial and could be applied to other animals with similar conditions. Though he was only with us for a short time, we consider the entire experience of caring for Prescott to be very valuable. It opened our eyes to a range of therapy methods that we might not have considered before trying them, as well as learning to work through situations that are a little unorthodox, such as searching for safety goggles for a cow. Most importantly, Prescott's quality of life was positively impacted by the team's efforts, and that's what truly matters.

## ACKNOWLEDGMENTS

Prescott's therapy could never have happened without the dedicated work of his therapists. We are grateful to Dr. Tari Kern of Pawsitive Steps Rehabilitation and Sports Medicine, Dr. Sarah Zucker of Mackinaw Veterinary Associates, and Dr. Cindy Kruske-Jordan of Animal Health Care of Chesaning for their time, expertise, and kindness.

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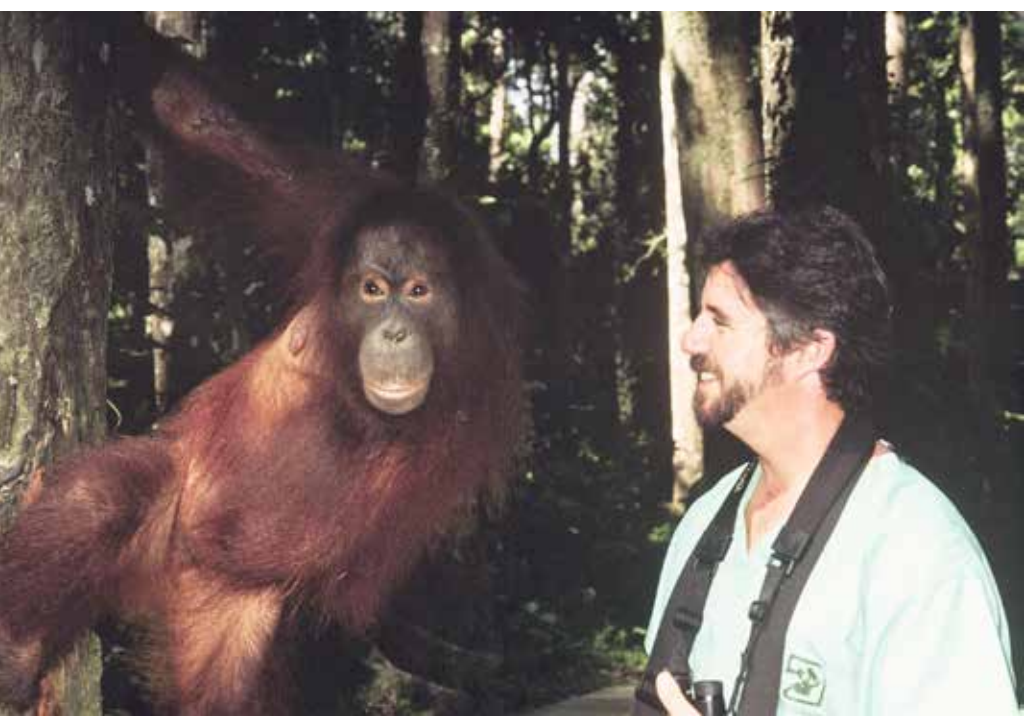
# ANSWERING THE CALL OF THE WILD WITH NORMAN GERSHENZ AND SAVENATURE.ORG

NORMAN GERSHENZ, DIRECTOR OF SAVENATURE.ORG

Norman Gershenz is the CEO and co-founder of SaveNature.Org and Director of the Insect Discovery Lab. SaveNature.Org has raised over $4.7 million to protect thousands of acres of rainforest, coral reefs, and desert habitats across the globe. Norm pioneered the first Adopt An Acre and Adopt A Reef programs in the U.S. and created the award-winning Conservation Parking Meter, both of which raise funds for global conservation efforts.

In the 1970s, Norm spent more than 18 years with the San Francisco Zoo, where he served as an educator, animal care staff member, fundraiser, and researcher. His adventurous side took him to Zimbabwe, where he tracked black rhinos, to Borneo to chase orangutans, and to Australia in search of the elusive platypus. He also cared for boas, hornbills, and snow leopards. But perhaps the highlight of his career was being the keeper of the pandas during their 1984 visit to the United States as part of the Olympics—a rare, once-in-a-lifetime experience.



Norman Gershenz, Director of SaveNature.Org, with a Bornean orangutan.

In 1987, while traveling in Costa Rica, Norm sought to meet Dr. Daniel Janzen, a renowned entomologist and conservationist. Janzen, who Norm regarded as a modern-day Darwin, was known for being blunt and critical, especially toward zoos. When Norm introduced himself as a zoo worker, Janzen quickly dismissed him, saying, “Zoos don’t do [anything] for conservation!” Norm, trying to save face, steered the conversation toward his research on scorpions at the California Academy of Sciences, and this bought him enough time to make a lasting impression. Little did Janzen know, Norm’s research and advocacy would later help secure hundreds of thousands of dollars in conservation funding.

Returning to the U.S., Norm investigated the state of *in-situ* (on-site) conservation in zoos across the country. He found that, in 1987, very few zoos

were engaged in meaningful *in-situ* conservation, and those that did were the wealthiest institutions. Inspired to create change, Norm developed the Conservation Parking Meter, the Adopt An Acre program, and founded the non-profit Ecosystem Survival Plan, later renamed SaveNature.Org. His vision was to empower zoos nationwide to actively involve visitors in the conservation of nature and all its biodiversity.

Norm's mission has always been clear: to connect people with the wild, ensuring the protection of wildlife through the purchase and safeguarding of habitats. He wanted zoos and aquariums to do more than care for animals in captivity—they needed to extend their conservation efforts to wild ecosystems as well. A favorite quote of his, from Aldo Leopold, sums up his philosophy:

"A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." Norm understood early on that zoos, aquariums, and other scientific institutions hold a unique power to educate and inspire the public. These institutions have the ability to reach 700 million people worldwide, sharing the importance of biodiversity and ecosystems.

For over 37 years, SaveNature.Org has provided people with ways to directly contribute to ecosystem preservation through innovative fundraising programs, such as the Conservation Parking Meter® and the Adopt An Acre® and Adopt A Reef® programs. These grassroots efforts have raised millions of dollars for *in-situ* conservation, helping to protect more than 30 million acres of land and marine habitats in countries including Belize, Bolivia, Brazil, Costa Rica, Panama, Namibia, Borneo, Peru, and others.

The Conservation Parking Meter, one of SaveNature.Org's most iconic initiatives, turns urban parking meters into interactive tools for rainforest conservation. When a quarter is deposited, a colorful hummingbird flies across the meter, symbolizing the saving of 90 square feet of rainforest. Since its launch in 1991, the Conservation Meter has been installed in zoos, aquariums, and even retail locations like the Rainforest Café, raising awareness and funds for conservation.

The Conservation Parking Meter, one of SaveNature.Org's most iconic initiatives.

Norm's collaboration with Dr. Daniel Janzen in Costa Rica's Guanacaste Conservation Area is one of SaveNature.Org's first—and most beloved—projects. The area, which encompasses 247 square miles of dry tropical forest, is home to about 2.4% of the world's biodiversity. SaveNature.Org's Adopt An Acre® program has been instrumental in ensuring this critical area remains conserved.

For 2025, Norm hopes to see all 2,800 animal care professionals in the American Association of Zoo Keepers (AAZK) donate a half-acre of rainforest in the Guanacaste Conservation Area in Costa Rica, honoring loved ones. This forest plays a crucial role in supporting species migrations and serves as a refuge in the face of climate change.

Norm's vision was to unite the passionate zoo and aquarium community to contribute to large-scale landscape and ecosystem preservation efforts. His work shifted the focus of conservation from single-species efforts to a broader, ecosystem-based approach, driven by science and local community engagement.

To recognize the efforts of those who go above and beyond in conservation, SaveNature.Org created the Conservation Prize in 1993. This award honors individuals, zoos, and aquariums for their exceptional leadership in saving wildlife and wild places.

Over the years, SaveNature.Org has honored dozens of AAZK Chapters and institutions, including the Suncoast Chapter, Hogle Zoo Chapter, Greater SF Bay Area Chapter, Milwaukee Chapter, Woodland Park Zoo Chapter, San Diego Chapter, Puget Sound Chapter, Greater Kansas City Chapter, John Ball Zoo Chapter, Northern Lights Chapter, Minnesota Zoo Chapter, Lincoln Park Zoo Chapter, San Antonio Chapter, Galveston Chapter, El Paso North Chapter, Smoky Mountain Chapter; with special recognition to the National

Aquarium in Baltimore, Oakland Zoo, Jenkinson's Aquarium, Dickerson Park Zoo, Seneca Park Zoo, Saginaw Children's Zoo, Lee Richardson Zoo, Chattanooga Zoo, Jacksonville Zoo, Sequoia Park Zoo, and Milwaukee Zoo with personal recognition bestowed upon Linelle Smith, Robin Shewokis, Rosemary Krussman and Ed Hansen.

Today, the emphasis in zoo and aquarium conservation efforts has shifted to protecting wildlife in nature, not just in captivity. To achieve accreditation, these institutions must now prioritize *in-situ* conservation efforts to protect entire ecosystems and evolutionary processes.

To date, SaveNature.Org has raised $5 million for 11 field conservation sites. These funds have supported the on-site management and protection of rainforests, coral reefs, and desert habitats, impacting millions of species and countless ecosystems.

In 1998, Norm and SaveNature.Org launched the Insect Discovery Lab, an educational program that has reached over 680,000 children in the Bay Area and beyond. Through this initiative, SaveNature.Org nurtures environmental literacy, helping young people connect with their natural surroundings and develop a sense of responsibility and stewardship for the planet. SaveNature.Org and its partners have earned national media coverage and multiple conservation awards, including the World Wildlife Fund Conservation Award and the National Environmental Council Award for Environmental Achievement. Norm himself has received numerous accolades, including the Elizabeth Terwilliger Prize for Conservation and the Lifetime Achievement Award from the American Association of Zoo Keepers. As Norm says, "There is an urgent need to build networks—not arks—to chart a new course for the preservation of biodiversity. Human activity is at the heart of both the problem and the solution." His work continues to inspire the next generation of conservationists, reminding us all that saving the planet is a collective effort.

Norm receiving the AAZK Lifetime Achievement Award with AAZK's Bethany Bingham.

*My Grandfather The Zookeeper*

**Film premiers during the AAZK National Conference on October 6th - you don't want to miss it!**

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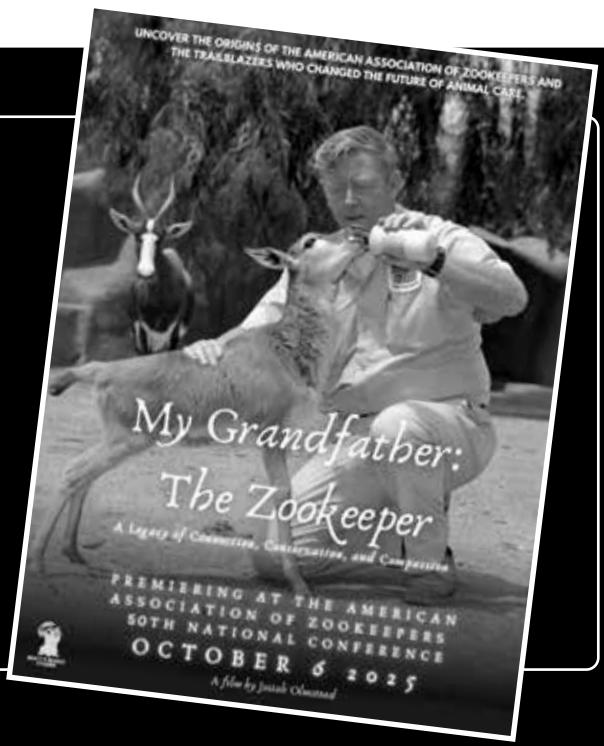


# UTILIZING KARDIAMOBILE® TO MONITOR HEART HEALTH IN TWO CHIMPANZEES

JORDAN GARBARINO, PRT PROGRAM SUPERVISOR, CHIMP HAVEN
ELLEN BRADY-MCGAUGHEY, ENRICHMENT COORDINATOR AND CAREGIVER, CHIMPANZEE SANCTUARY NORTHWEST
MARY ROBINSON, MAINTENANCE SUPERVISOR, CHIMP HAVEN
AMY FULTZ, WELFARE SCIENTIST AND DIRECTOR OF SPECIAL PROJECTS, CHIMP HAVEN
REBEKAH LEWIS, DIRECTOR OF BEHAVIOR, CHIMP HAVEN
KEITHVILLE, LA

## POSITIVE REINFORCEMENT TRAINING PROGRAM BACKGROUND

Chimp Haven is a sanctuary housing over 300 chimpanzees (Pan troglodytes) across 200 acres in Northwest Louisiana. The majority of the sanctuary's residents were once used for biomedical research. Chimp Haven has a formal Positive Reinforcement Training (PRT) program consisting of five increasingly advanced skill levels, which all animal care staff participate in. Chimpanzees are cued to present parts of their body, reinforced either throughout the duration of a behavior or at completion. Jackpots, or larger high-value reinforcers, are also offered after a leap in learning a behavior, or at the end of a session. It is important to note that the chimpanzees are not asked to separate from their social groups to train, and instead can elect to engage with conspecifics instead of their trainer. Upon reaching the fourth skill level, trainers are eligible to receive additional instruction and begin shaping medical behaviors. At Chimp Haven, chimpanzees are assigned a specific trainer upon request, with additional weight given to any medical priorities communicated by our veterinary team. Prioritized medical behaviors can include, but are not limited to: temperature monitoring, otoscope, awake ultrasound, wound cleaning, laser therapy, injection training, glucose monitoring, and heart health monitoring. These beneficial behaviors increase diagnostic information about the health of the chimpanzees between scheduled physical exams, while reducing the stress of administering awake medical treatments.

## INTRODUCTION

The incidence of cardiovascular disease has been documented in chimpanzees since the 1970's (Schmidt, 1978). Studies have consistently concluded that cardiac disease is the leading cause of mortality in captive chimpanzees (Munson & Montali, 1990; Doane et al., 2006; Kumar et al., 2017; Barbour et al., 2020). Cardiac conditions include sudden cardiac events resulting in an untimely death (Lammey et al., 2008). Sometimes the cardiac event preceding death is the first sign of existing cardiac illness (Doane et al., 2006).

As cardiac health concerns for great apes continue to grow, the need to consistently monitor and intervene has become evident. Electrocardiography (ECG) is a common human method of detection, easily applied to great apes under human care. ECG readings obtained during sedated routine physicals provide valuable information on the overall picture of an animal's heart health (Doane et al., 2006). This method of monitoring does present limitations: intervals between examinations; influence of sedatives on readings, the effects of which have not been fully explored in chimpanzees (Doane et al., 2006; Barbour et al, 2020); and risks associated with utilizing sedatives frequently on a subject with known cardiovascular disease (Barbour et al., 2020).

Improved diagnostic medical information between physical examinations may reduce the need for additional sedations (Barbour et al., 2020). A new device to monitor

Figure 1: KardiaMobile® Holder Model 1, Credit: Chimp Haven

cardiac health may address some limitations of sedated ECG readings: the KardiaMobile® (AliveCor, 444 Castro Street, Mountain View, CA, 94041; https://alivecor.com/). Using PRT practices with great apes to integrate the device allows more frequent, awake monitoring and detection of cardiac disease. It also monitors effectiveness of medical interventions in such conditions (Barbour et al., 2020). While the KardiaMobile® cannot replicate all facets of more advanced ECG machines utilized during sedations, it remains a valuable diagnostic tool capable of providing ongoing supplementary information to veterinary teams managing great ape populations (Barbour et al., 2020).

Human users of the KardiaMobile® must apply pressure with their fingertips on two metal pads and make consistent contact for 30 seconds to obtain a reading, which is stored in an application on the user's cell phone or device. The methodology to obtain readings is the same in chimpanzees, with the application stored on a caregiver's device. Trainers at Chimp Haven have used KardiaMobile® devices since 2019, collecting over 150 full-length readings from 14 chimpanzees.

Here we share our journey to training this behavior successfully, including the materials needed, two individual case studies, and how we navigated various learning barriers.

## HOLDER DESIGNS

The KardiaMobile® device is battery operated and wireless, requiring a strong Wi-Fi connection or sufficient cell phone coverage to connect. A holder was designed to mount the KardiaMoblie® and hold the trainer's device during sessions, intended to keep the monitor steady while preventing the chimpanzees from interfering. A dedicated holder for the user's device allowed easy visualization of readings and necessary adjustments for behavior duration. The holder also frees up the trainer's hands to provide cues and reinforcers as needed.

The first holder (Holder Model 1; Figure 1), created by Chimp Haven's Maintenance Manager, was a wooden block mounted to a PVC pipe, attached to a tray made of Ultra-High Molecular Weight PolyEthylene (UHMWPE) to hold a Bluetooth-enabled user device. The wooden block housed the KardiaMobile®, cut to fit its exact size, with a single prong to hook and rest on the mesh. This model was effective for its portability, lightweight design, and ease of removal from the mesh. It allows for adjustment of the angle of the KardiaMobile® device for finger positioning. This holder provided a challenge, as it required the trainer to steady it during use, while engaging with their trainee and monitoring the social group.

Our Maintenance Manager created a second KardiaMobile® holder (Holder Model 2; Figure 2) with trainer feedback. Holder Model 2 is self-supporting, with two prongs and an elbow to rest securely against the mesh. A hinged piece of clear plexiglass protects the user's device bay from potential biohazards, such as chimpanzee spit, urine, or feces. We modified the space and attachment for the KardiaMobile®, improving effectiveness for multiple chimpanzees with different finger lengths. Challenges with Holder Model 2 are increased weight/size, and models with larger elbows limit mesh placement.

Trainers at Chimp Haven presently use both holder models, depending on chimpanzee preference, finger length, and environment. As we expand the number of trainers and chimpanzees working on this behavior, we will continue to adapt our two KardiaMobile® holder models. One recent update included adding disposable or reusable zip-ties to secure the KardiaMobile® more thoroughly for Holder Model 2 (visible in Figures 2 and 3). Cup holders were added to some versions to store reinforcers for easier access. A comprehensive list of measurements and materials can be provided upon request.

## CASE STUDIES

### TABU AND TRAINER JORDAN

Tabu is a 32-year-old male chimpanzee who was relocated to Chimp Haven in 2019. Tabu was initially trained to present his hands, feet, lips, head, belly,

and to touch a PVC target. Tabu began KardiaMobile® training in 2021 after his annual physical exam revealed a cardiac arrhythmia (L. Novak, personal communication) and medication was initiated. KardiaMobile® training was of specific interest in Tabu's case as it allowed for continued monitoring of his condition and efficacy of medical intervention.

When we began shaping for this behavior, we started desensitizing Tabu to Holder Model 1. He showed no aversive reactions, such as pulling away, fear grinning, screaming, or hitting/swatting at the equipment. Once a reinforcement history was established with touching the holder, criteria was raised to Tabu being reinforced when both hands were placed on the holder. This was a difficult part of training, as we shape left and right-hand presentation separately with cues for each, not in combination. I initially tried to utilize both hand cues together, but ultimately developed a new cue, "Both." Focus was placed on reliably presenting both hands, versus exact hand placement, which took several months. Chimp Haven is a "No Touch" facility; no physical contact with residents occurs without specific approval from senior leadership. Such approval may be requested for KardiaMobile® training.

Once Tabu was reliably presenting both hands and approval was received, we began desensitization to contact, followed by increasing the duration he would hold. When we introduced the KardiaMobile®, Tabu showed no aversive reaction to the device and maintained his two-handed hold well. We adjusted his finger placement on the device sparingly and phased out contact by gradually raising reinforcement criteria. Despite the time invested in reaching the goal and improved Wi-Fi access, we were unsuccessful in getting readings. In mid-2022, I partnered with co-author Ellen to train Tabu to increase both his touching pressure and duration. Providing Tabu continuous reinforcement, a constant stream of juice, was suggested to reduce contact and maintain the hold behavior. It was also helpful to have an additional trainer aid with group management.

A secondary trainer, improved Wi-Fi connectivity, and continuous reinforcement for hand placement led to our first full diagnostic reading with Tabu in October 2022. As KardiaMobile® readings are sent to the chimpanzee's veterinarian for evaluation, Tabu's clinician confirmed the arrhythmia diagnosis and that he was managing well on his medication regimen (D. Coleman, personal communication). We used Holder Model 1 for the initial reading, but had increased success with Holder Model 2, which accommodated his finger length and hung independently on the mesh. Our goal is obtaining monthly readings from Tabu to provide our veterinarians with regular updates. After nearly two years of reaching our initial goals, we have successfully accomplished eight readings. When Tabu sees the KardiaMobile® holder now, he immediately puts his fingers out for a reading. (Figure 3).

Figure 2: KardiaMobile® Holder Model 2. Credit: Chimp Haven

### TWYLA AND TRAINER ELLEN

Twyla is a 37-year-old female chimpanzee who was relocated to Chimp Haven in 2013. Unlike Tabu, she does not have an existing heart condition, but we prioritized consistent readings with the KardiaMobile® to identify potential future heart conditions. With Twyla, we generalized separate hand presentation cues to present both hands at the same time. Her rapid comprehension allowed us to transition to a single cue of pointing to the KardiaMobile®. When Twyla exhibited low interest in the device and an aversion to contact with trainers, we adjusted the training parameters for Twyla from those used for Tabu. Receiving a jackpot for allowing her extended fingers to be touched briefly by Holder Model 1, tilted upward to make contact, increased Twyla's confidence. She was reliably touching the KardiaMobile® within two training sessions.

Though Twyla is highly motivated by juice, her responses indicated she had learned that initiation of reinforcement meant that the behavior was over. Twyla had not previously experienced continuous reinforcement, nor extended hold durations. Since she would withdraw her hands once juice was provided, we kept KardiaMobile® sessions short to mitigate frustration. It took co-author Jordan and I several months to address Twyla's aversion to contact. After various unsuccessful methods for increasing hold times,

Figure 3: Tabu presenting for an awake EKG. Credit: Chimp Haven

co-author Jordan and I finally experienced a breakthrough moment and success using finely-cut apple pieces for continuous reinforcement. Twyla received jackpots for not pulling away, allowing us to slowly increase hold duration. We transitioned back to juice for continuous reinforcement, our preference since it is easier to provide. Twyla connected uninterrupted reinforcement with extended holds, and we quickly began getting diagnostic readings. Though Twyla refused human contact, she quickly learned to adjust her fingers based on where the trainer was pointing. We learned that positioning difficulties could be "reset" if the KardiaMobile® holder was removed and then replaced on the mesh.

Twyla is averse to some ground substrates, almost exclusively hanging from the mesh and preventing KardiaMobile® training outside. When training inside, noise from other chimpanzees, fans, and electrical equipment in the area interfered with her readings. Twyla enjoys training and displaces other group members when trainers attempted the same behavior with them. It took approximately two years from introducing the holder to obtain a reading with Twyla, though we have obtained five diagnostic KardiaMobile® readings since. (Figure 4)

## LESSONS LEARNED

Through attending great ape training conferences, trial and error, and reading other trainers' experiences, we improved our equipment's efficacy and ability to obtain readings in our sanctuary setting.

### INTERFERENCE

The KardiaMobile® is very sensitive to stimuli from the chimpanzees' environment. Even a chimpanzee pant hooting or displaying on the mesh nearby affects a reading, possibly preventing our veterinarians from collecting valuable information (Figure 5). A secondary trainer is helpful to mitigate internal group interference, while providing the flexibility to train in more secluded enclosure locations. Seasonality creates interference with the quality of our readings. The KardiaMobile® is notably sensitive to noise from fans we provide to the chimps for extra cooling during warmer months; their hum dilutes readings or prompts a warning of potential interference from the application. Readings were difficult to obtain when it was cold and a chimp had been spending time outdoors prior, interfering with a quality connection regardless of chimpanzee finger placement and pressure. We hypothesize that cooler temperatures result in vasoconstriction in the chimpanzees' extremities to minimize heat loss, affecting the ability to obtain a reading. We hope to explore this in the future.

### CLEANLINESS AND CONDUCTIVITY

Feedback from trainers at other facilities indicated that cleanliness of the device and chimpanzee fingers could alter a reading, though moisture increases conductivity between the chimp's fingers and the KardiaMobile®. Due to our minimal contact policy, we cleaned the device with alcohol wipes instead of the chimpanzees' fingers, hoping to improve connectivity and conductivity. It was easier to obtain a connection when the device was cleaned promptly before or between attempted readings. We have not chosen to desensitize trainees to cleaning their fingers, though that may be considered in the future.

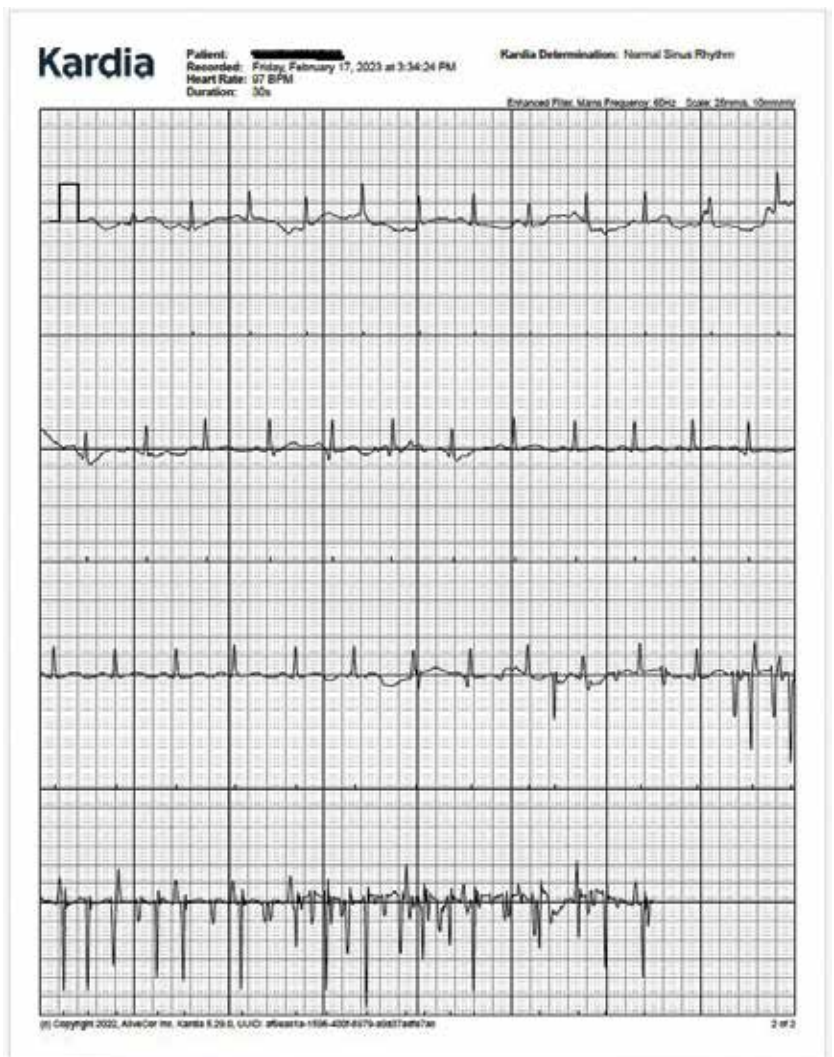
### GLOVES AND HUMAN INFLUENCE

We were concerned that a trainer's fingers, periodically in contact with the chimpanzees, might disturb or alter a reading. Staff wear 8 or 10-mm thickness gloves when in chimpanzee areas and interacting with them. We are unsure if glove thickness prevents interference from our own heart values when we provide slight pressure on top of a chimpanzee's fingers to encourage increased hold duration. We hope to also explore this topic further; currently, we limit contact during a reading, for our safety and to prevent potential disruption of the reading.

### ADAPTABILITY OF SHAPING PROCEDURES

Through experience we found multiple ways to accomplish the goal of obtaining awake ECGs using the KardiaMobile® device. While we have a general shaping plan for the behavior, different chimps

Figure 5: A KardiaMobile® reading showing visible interference from a chimpanzee displaying. Credit: Chimp Haven




needed different methods to understand the concept. We advocate flexibility and creativity in overcoming obstacles as trainers shape this behavior. An excellent example is hand presentation; since each trainee responded and learned differently during sessions, we applied varying adjustments for each individual. Because we saw a variety of chimpanzee responses during the early stages of KardiaMobile® training, we did not develop a shared verbal cue or hand signal. Instead, trainers could adapt their training approach and cue to their trainee. With so many variations and successes, we are glad to provide further details upon request. Remain patient and creative, remembering that what works for one individual may not work for another, which is okay. Ask for help occupying other trainees in groups and brainstorm solutions, allowing successful readings to benefit each individual chimpanzee's health and welfare.

## CONCLUSION

Since Chimp Haven trainers started shaping KardiaMobile® ECG monitoring in 2019, we have made many adaptations. We remain flexible with each individual chimp, while evolving our equipment and knowledge to provide quality readings to our veterinary staff. We have increased trainer collaboration, sharing ideas and supporting one another, which has proven beneficial for our team. Having another trainer present to celebrate a breakthrough creates a way for us to motivate and reinforce ourselves for our KardiaMobile® successes.

Routine awake ECG readings can influence many welfare decisions for chimpanzees. Our goal is to continue to make ECG readings easier to obtain from our residents, while sharing information with other facilities. As we move forward together, we are receptive to collaborating with trainers from different facilities to improve access to awake ECG readings in chimpanzees under human care.

## TRAINING TALES COMMENTS: BY JAY PRATTE

**As there was so much amazing information and detail in this Tale, I'll briefly highlight what I feel to be key points.**

- **Clever use of existing human technology. While chimpanzees are arguably easier to adapt human methods to than other non-primate taxa, it's a great reminder that we don't need to reinvent the wheel. KardiaMobile® use correlates well to great apes, and other human medical equipment may benefit different species. One example, while training voluntary (protected contact) tail blood pressure readings with big cats, we discovered that human child-sized cuffs worked best for a reading from the base of a lion's tail, and the constriction during a reading helped with drawing blood (a concurrently trained behavior).**
- **Flexibility. Adapting parameters to individual trainees. 'Nuff said.**
- **We all have individual training goals within our teams and facilities. Sharing our successes publicly and collaborating with other institutions, via ZIMS or other methods, allows husbandry and operant conditioning to advance and evolve as sciences. AND it may help someone else skip some early steps when learning how others have experienced challenges and success.**

**Excellent Tale! Thank you to the authors and their team for making this possible.**


## ACKNOWLEDGEMENTS

Our thanks to all co-authors for contributing to this paper. In particular, we thank Mary Robinson for the creation of our KardiaMobile® holders and listening to our many training material wish lists. We thank Sabrina Boyd for writing the original shaping plan, her successful training of this behavior with several chimpanzees, and helping solve early hurdles. We also thank our facility's veterinarians, Dr. Raven Jackson and Dr. DaShaunte Coleman, for mirroring our excitement with every new reading and sharing information with us. We thank our supervisors, Rebekah Lewis and Lindsey Peters for their support throughout the training and drafting process. Finally, we are deeply grateful for the opportunity to train each chimpanzee and the lessons they have taught us.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# EMERGENCY RECALL TRAINING OF 3.0 WESTERN LOWLAND GORILLA GROUP AT ZOO ATLANTA

SARA FEE, SENIOR KEEPER PRIMATES
ZOO ATLANTA, ATLANTA, GEORGIA

Since 1986, there have been more than 11 documented situations where zoo visitors have either accidentally fallen into or have chosen to climb over safety barriers into animal habitats, resulting in several human and animal incidents. While we as zoo and aquarium staff cannot completely control the actions and choices of the visiting public, we can do our best to prepare our animals to respond to these types of situations. Most notable in recent memory was the 2016 incident at the Cincinnati Zoo involving the young silverback, Harambe, which hit close to home being, myself, a career gorilla keeper.

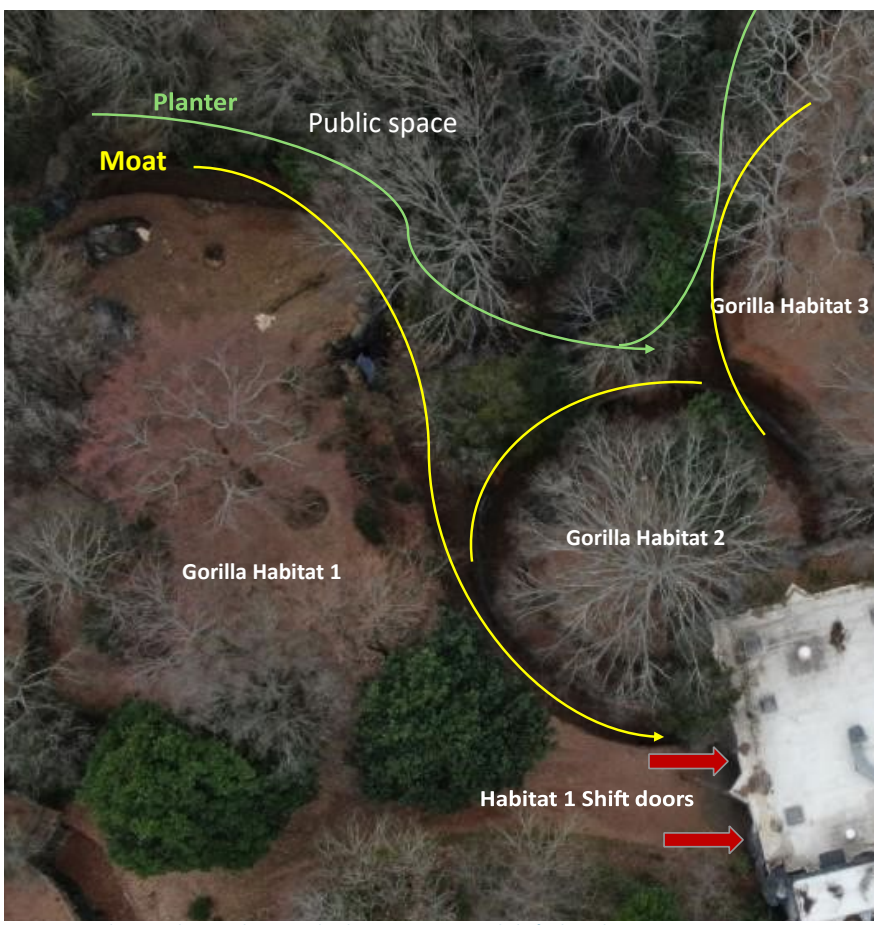
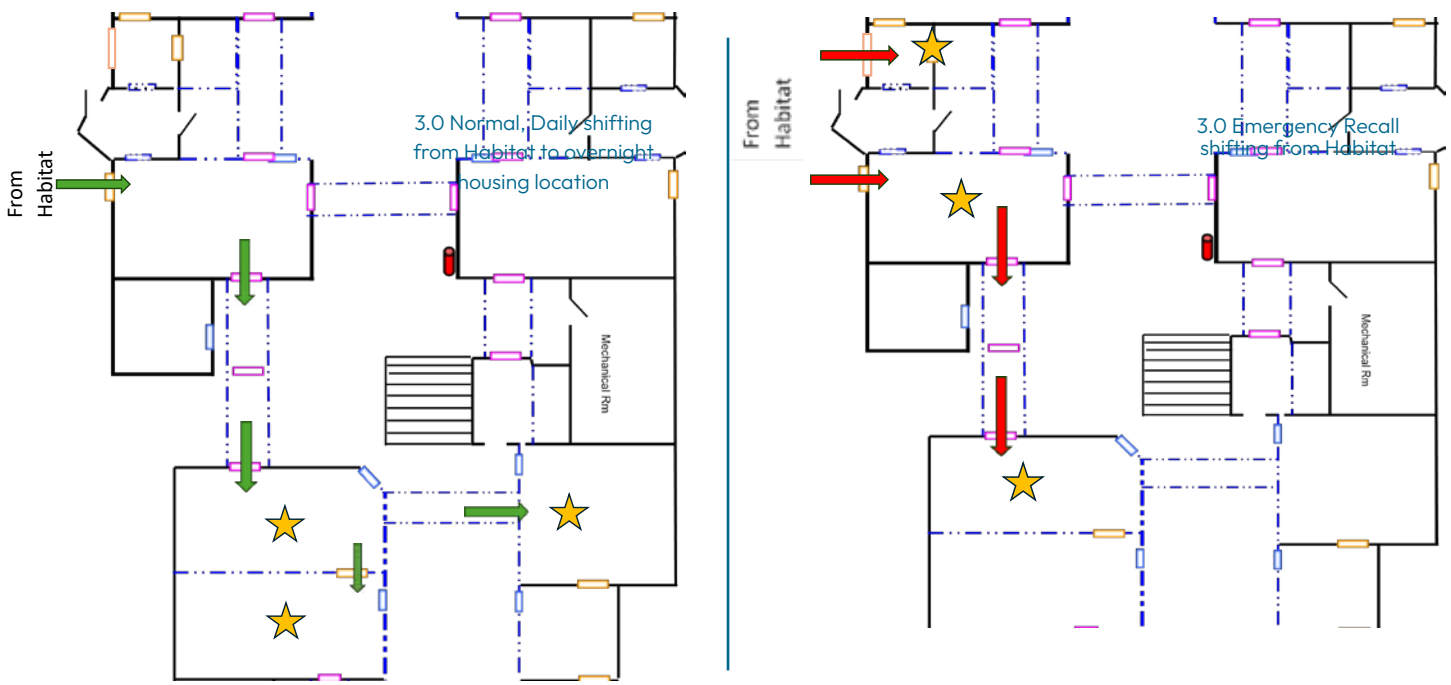



Figure 1.Habitat 1 drone photo with planter, moat and shift door locations

Zoo Atlanta in Georgia, USA, has the luxury of having mostly favorable year-round weather, allowing us to have open-air outdoor space for our four public-view western lowland gorillas *(Gorilla gorilla gorilla)* habitats. Our habitats have 15-foot-deep dry containment moats that separate the habitat space from a planter bed space; the public natural wood fencing is then outside these moats. In order to give our guests the best experience possible, we have integrated aspects of our exhibit designs to allow for the best viewing; however, we recognized that these alone would not indefinitely keep a determined person from climbing over those barriers. Unfortunately, over the past five years, we have had incidents where adults have chosen to climb those barriers into that planter space (Figure 1), and one wrong step could have easily resulted in them falling into the moat area of the habitat. While several of our habitats are built to not allow our gorillas to have access to that moat, our Habitat 1 moat is accessible to any gorillas in that space. Habitat 1 is where we house our 3.0 bachelor group of Charlie (26), Stadi (31) and Kekla (33).

After these incidents of humans climbing the barriers, for reasons ranging from retrieving personal items to taking selfies, Zoo Atlanta prioritized recall training for our 3.0 bachelor group. These gorillas have been together




for over 20 years, with occasional hierarchy changes, but overall are a very cohesive group. They are housed inside overnight in separate spaces determined by the gorillas' own behavior over the years. Their on- and off-habitat shifting can be done using two separate shift doors leading through two different rooms that connect via overhead shifting tunnels and then to an upstairs exhibit holding. During normal shifting they are all moved inside one at a time through one door, then shifted upstairs in the building into three separate rooms (Figure 2). Usually, two keepers are utilized in shifting scenarios, but this process can be done easily and safely with just one keeper.

3.0 WESTERN LOWLAND GORILLAS, KEKLA, CHARLIE, STADI. PHOTO COURTESY OF ADAM THOMPSON, ZOO ATLANTA

## IN THE BEGINNING

When we started to discuss and take first steps in training this recall behavior, we knew there would be the possibility that, in case of a real emergency, the recall process should be able to be completed with just one keeper, so we planned to utilize our two-door entry from the habitat, in order to secure animals off-exhibit as quickly and safely as we could. This would not be unusual for these males, as often we use both doors on days of inclement weather.

Before anything was to begin with actual shifting, we knew we needed to establish a cue with a very high-value reinforcer (HVR+), so they knew when they came to that cue, they were going to get fabulously rewarded! This was honestly one of the hardest parts of training this group. We started with very novel items, things we could have on hand all the time, for training purposes. After several attempts at very novel items, we found that a large chunk of fresh pineapple was what these boys were into. We then determined that in order for this item to maintain its HVR+ status, it would only be given to them for recall training scenarios. This was not an issue as pineapple was not part of their normal diet anyway, yet is an easy item to get from our Animal Nutrition Kitchen and is approved by our Veterinary Team to use for this training process. We also had to think through what the actual cue was going to be. It needed to be something everyone could use, and loud enough for the gorillas to hear anywhere they might be in the habitat, even over the sound of possibly loud visitors. You know what we needed … a cowbell! And it worked, just as we needed it to.

## PAIRING THE CUE

Discovering our HVR+ was a matter of trial and error. We would ring the cowbell with the males already separated in the night house spaces, usually at the end of the day, then quickly provide them with the HVR+. Thankfully gorillas have a beautiful "tell" of excited happy grumbles when they get, or know they are going to get, something they enjoy. We did the cue pairing for a few trials with different items, and when we were consistently hearing the enthusiastic happy grumble, we landed on the pineapple as being the most rewarding.

Now it was time to start moving the Cue on to the habitat during normal shifting times and shifting scenarios. We would ring the cowbell, open the primarily-used shift from the habitat shift door, and bring the boys in per usual, heavily reinforcing with that HVR+ once they were in their associated overnight housing room. Once we were confident that they were solid on the cue and shifting, we began modifying the shifting schedule slightly, so they weren't able to anticipate the shifting times. This was when we began seeing their real enthusiasm, as they would run to the building to get inside for their HVR+. This was when we began utilizing the two-door entry system to (1) get the animals inside and secure more quickly, and (2) prevent any potential tie up as Charlie and Kekla had begun racing each other inside (Figure 3).

After a few months of trial sessions at various times of day, we now decided it was time to introduce minor distractions into the training to see how highly they valued their inside pineapple time. This was done while the gorillas were receiving their favorite portion of their diet, their fruit, on the furthest part of the habitat from the building. One keeper stationed the males at the front of the habitat, which was a part of their everyday husbandry, and mid-way through, they were cued to recall. Kekla was closest to the building, Charlie the furthest and Stadi in between, sitting, at the time of this cue. To our delight, Kekla ran to the building, Charlie was shortly behind him but was trying to beat him inside, and Stadi even ran a few paces towards the building, which he had never done before in a recall session! We were very excited and confident in our boys' response to the cue, and all three boys were secured inside in less than one minute.

## NEXT STEPS

As these boys progress with this training, we would like to step up the distractions in order to know how strong this recall behavior is. We are in the process of organizing a practice drill where a human shaped mannequin is thrown into the moat, as if a human had fallen into the habitat space. All areas of response would be enacted, not only for the gorilla group and care team to practice their training, but also for the entire Zoo to practice their response to a human in the same space as a dangerous animal without a barrier.

Having four separate groups with the ability to rotate habitat space provides us with the challenge of training each group separately, to different cues for each group. These groups vary from our 3.0 bachelor group, which has been highlighted, to our large family group of 2.7, our small family group of 2.3 and our geriatric group of 0.2, each with their own shifting habits to build on and variable ability to provide reinforcement. For each group we needed to consider having a cue device that any care team member could use in an emergency, and with all the caveats for functionality as discussed in this article. We have also made significant progress with both our family groups, and they are shifting reliably and purposefully when cued.

Every group and species are going to need to have their own considerations for things like HVR+, how that reinforcement is provided successfully, housing and shifting needs, and frequency of trials, to get it right. With patience and practice, recall training is rewarding and valuable for the safety of our animals and the public.

*Photo credit to Adam Thompson/Zoo Atlanta of 3.0 western lowland gorillas, Kekla, Charlie, Stadi*

## TRAINING TALES EDITOR COMMENTS BY KIM KEZER ZOO NEW ENGLAND

Emergency Recall Training is a complex behavioral goal comprised of many components and countless variables, but the end goal is the same no matter the distraction or the time of day. Including variability into your training plan with regards to time of day, frequency, and distraction intensity will help to build a reliable emergency recall as was described in this Training Tale. In addition to the safety benefit for animals, staff, and visitors, emergency recall training presents opportunities for team building, zoo-wide participation, while providing zoo guests the opportunity to see behavioral conditioning in action. Interpreters can be located outside the habitat to share information about behavioral conditioning and enrichment, along with the importance of emergency recall training. While the animals are inside receiving high-value reinforcement items, other members of the team can provide novel enrichment that would not normally be offered on the habitat. A common challenge is getting the animals to shift back outside after being recalled inside. Careful thought into continuing the positive reinforcement when they return outside is critical to the training plan.

When considering the perfect high-value reinforcers, keep in mind the ease of acquiring the items, shelf life, and storage. After all, this training goal is in anticipation of an unexpected event, and non-perishable items may not be practical nor easy to acquire in the moment. Pineapple is a favorite of our gorillas, so we have a supply of canned pineapple always available. Dried fruit is another favorite that has a long shelf-life and can be stored in the refrigerator. For recalling carnivores, maybe store whole prey items in a freezer that can easily be accessed in an emergency. Be creative and always think of always having high-value items saved only for those "just in case" moments.

Emergency Recall training is incredibly rewarding to see in action; first while training, but it is jackpot-level reinforcing for trainers when it works as intended under unexpected circumstances. The process can be fun and bring out the creativity in all of us, though you do not have to reinvent the wheel. Many successful examples exist, and can be found as articles or videos, helping you develop the foundation for your plan. Reaching the final goal of successful recalls will increase animal activity and provide opportunities for zoo guests to watch the animals interact with enrichment after the event.

Thank you for sharing this Training Tale. I hope many of you will train the animals for unexpected recalls off-exhibit.

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