

PHYSICAL REHABILITATION IN A FLORIDA PANTHER WITH SEVERE OSTEOARTHRITIS: A CASE STUDY

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Osteoarthritis (OA) is one of the most commonly treated conditions in physical rehabilitation. In addition to pharmaceutical management of pain and inflammation related to OA, it is well documented that rehabilitation is one of the most common approaches used to treat impairments caused by the condition in both humans and canines. However, as far as we are aware, this is the very first attempt to treat OA in a wild animal in captivity using rehabilitation principles. As far as we know, this is the very first attempt to use rehabilitation to manage the mobility difficulties presented by a Class 1 feline in any zoological facility in the United States.

HISTORY

Neiko is a Puma Concolor Coryi also known as a Florida Panther, a subspecies of the mountain lion, born in April 2005. As cubs, Neiko and his sister, Lucy underwent a declawing procedure of all four limbs. Beyond that, they have had a healthy life the majority of their years. The panthers were rehomed to Gatorland at approximately 7 years old, where they received top notch nutrition and 24 hour medical care. Dr. James Bogan, DVM and Danielle Lucas, Animal Care Director were in charge of Neiko and Lucy's medical and regular care throughout their residency at Gatorland.

Under their monitoring, it was noted around 2018 that Neiko and Lucy began to show difficulties with mobility. They were placed on a whole prey diet, along with joint health supplements. By early 2020, they had stopped using the platforms in their enclosure and engaged much less enthusiastically with their enrichment toys. They even stopped playing in their pond, which used to be a favorite spot for both felines. By mid-2020, Neiko was showing greater difficulty with basic mobility and the crepitus in his joints was audible from across the habitat. He would trip over small obstacles like an electrical cord on the ground, and often would fall down when stepping down one single 8-inch step into their outdoor habitat.

Neiko's care team reports he has been having difficulty stepping up one step, walking, running, playing, laying down, and standing up from a lying position. They reported Neiko opts to urinate while lying down sometimes and he limps when walking. Neiko also falls sometimes when standing up.

Due to the evident difficulty and joint pain demonstrated by Neiko at the time, humane euthanasia was considered, but the Animal Care Team at Gatorland decided to try rehabilitation before making such an irreversible decision.

The team's top priority for Neiko and Lucy was quality of life. While Lucy was also showing mild mobility impairments, the

main concern at the time was Neiko's rapidly declining mobility. This case study will focus on Neiko, though she also received physical rehab. The goal of the Animal Care Team was for Neiko to be seen walking/laying down without pain, swaying or limping, reduce pain, and improve overall mobility.

At the time of evaluation, 9/2/2020, Neiko was receiving Wildtrax Senior Supplement and Cosequin daily in addition to 50mg of Tramadol and 800mg of Gabapentin twice a day.

Physical Examination 9/2/2020:

It is worth noting that objective measurements were difficult to obtain at initial evaluation due to an initial lengthy veterinary examination without sedation, as well as the therapist not being allowed to be present inside the enclosure for safety reasons. Contact was only allowed with the presence of a safety barrier initially. It wasn't until later sessions that more direct contact was possible.

Posture Assessment

- In sternal: Neiko is able to attain square sternal posture. However, he prefers to place bilateral hind limbs in a significantly more caudal position, placing bilateral hind paws at the mid thoracic level.
- In standing: Neiko exhibits mild kyphosis of the lumbar spine

Functional Assessment

- Marked difficulty noted when rising from sit, sternal, and lateral recumbent - noted severe front limb compensation. Front limbs are primarily driving the rise from sitting and lying.
- Minimal eccentric control when transitioning from stand to sit
- During evaluation, Neiko urinated while in lateral recumbency rather than standing
- Did not observe any transitions to higher level surfaces/platforms available in enclosure today

Gait Assessment

- Grade 3 lameness noted over bilateral hind limbs during walk. Mild lameness observed over bilateral front limbs. Lameness was scored on an ordinal visual analogue scale from 1-5 defined as; no visual lameness (grade 0), mild lameness with minimal head/pelvic movements (grade 1), moderate lameness with normal stride length and partial weight bearing (grade 2), moderate lameness with reduced stride length and partial weight bearing (grade 3), severe lameness with minimal use of limb (grade 4), and non-weight bearing lameness (grade 5).
- During walking, plantar collapse of bilateral metatarsi (R>L) is easily observed. R hip thrust observed while walking on exhibit. R stifle instability observed during walk.

Palpation

- Spheroid mass palpable cranial to calcaneal tendon (bilaterally) larger on right than left

- Spheroid mass palpable cranial to tibiotarsal joints (bilaterally)
- Crepitus palpable and audible with AROM of bilateral tarsi

Neurological Assessment

- Withdrawal reflex, superficial and deep pain sensation were normal throughout all four limbs

Radiographs were taken by Dr. Bogan on 9/2/2020 without sedation. The radiographic findings include:

- Bilateral hip OA R>L – markedly reduced joint space
- Regrowth of 3rd phalanx of 4th digit on R hind with evidence of nail regrowth
- Moderate tendon & capsular thickening on plantar aspect of bilateral tarsi & metatarsi
- Plantar surface collapse (bilateral tarsi)
- Caudal lumbar IVDD without evidence of extrusion
- Evidence of R calcaneal tendon calcification
- Severe DJD at both tibiotarsal joints. R>L
- Multiple spherical masses over bilateral shoulders
- Osteophytes noted over several lumbar and thoracic vertebrae

Assessment

Neiko is a 15-year-old Florida Panther presenting with caretaker reports of evident joint pain, lameness, weakness, and significant decrease in function. Neiko exhibits compensatory patterns with walking, transitions, and posturing. Objective ROM, strength and girth measurements were not obtained on initial evaluation due to having radiographs taken under behavioral restraint just prior. Neiko's endurance and tolerance to handling was decreased, limiting today's assessment to a visual exam and minimal palpation of bilateral hind limbs.

Neiko presents with tissue thickening, palpable joint hypertrophy & crepitus over bilateral tarsi. He exhibits concentric and eccentric hind and forelimb strength deficits evident by marked limitation and lameness with walking on level ground, sit to stand, and sternal to stand transitions. Proper posturing for bowel/bladder functions was not observed.

Neiko would benefit from skilled physical rehabilitation and laser therapy to address impairments identified, reduce pain and inflammation, and maximize function.

Goals:

1. In 4 weeks – Neiko to demonstrate bilateral hind limb full ROM in order to be able to assume sit, sternal, and posturing positions independently without compensation.
2. In 6 weeks - Neiko to demonstrate bilateral hind limb strength to >3 to be able to perform sit to stand and sternal to stand transitions independently without compensations or collapsing on descent.
3. In 10-12 weeks - Neiko to demonstrate no evidence of bilateral hind limb instability or weakness to be able to safely return to low level jumping (2-4ft), walking at a pace, and playing with enrichment equipment.

Treatment Plan 9/2/2020:

Neiko will participate in rehabilitation sessions 2 times a week for 6 weeks initially. Contingent upon the patient's progress, he will benefit from continued skilled therapy yet gradually decreasing the frequency until goals have been attained. Neiko's sessions will

include manual therapy (joint mobilizations, traction, stretching, soft tissue massage), modalities such as LASER therapy to improve circulation, reduce pain and inflammation, and therapeutic exercises aimed at improving balance, strength, and endurance. The animal care team will be instructed in a daily "home" program that include some exhibit modification to add cavaletti poles and a modified A frame to provide ample opportunity for the felines to engage in therapeutic activities even without luring or prompting.

Treatment

Manual therapy

PROM of bilateral tibiotarsal joints, massage of right calcaneal tendon, tail traction, bilateral SI joint gapping/traction.

Therapeutic exercise

Neiko started clearing 2-inch diameter cavaletti poles placed on the ground initially and gradually progressed to clearing the same poles raised to 6 inches for a total clearance height of 8 inches. Other exercises included weight shifting with front limbs elevated onto a 14-inch platform, side steps on a flat surface with hand support provided for tail control, and circle walks in both directions. Walking up/down a modified A frame with a flat top was added in March of 2021 to address hip extensor strength with the use of walking on an incline. His therapeutic exercise sessions initially were limited to approximately 15-20 minutes due to poor endurance.

Modalities

LASER - Respond Systems 2400VS unit class 3b.

Superpulsed probe, 3500PPS, 3J/cm² to bilateral tarsi, metatarsi, and stifle, bilateral hips, lumbar spine, and thoracic spine.



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Clinical Progress:

- On 10/4/2020, Neiko was observed playing in the pond which he had not done in at least 2 years.
- On 10/6/2020, Neiko was able to clear the step to access his outdoor habitat without falling down for the first time.
- On 10/16/2020, Neiko was able to clear cavaletti poles at 8 inches tall without tripping over.
- By 12/3/2020, Neiko was observed attempting to access the lowest platform available in the outdoor exhibit, though unsuccessfully.
- By the end of April 2021, Neiko was able to walk up and down the modified A frame without a rest break for 10 repetitions.
- By May 2021 Neiko's therapeutic exercise sessions averaged 40 mins of nearly continuous exercise.

Clinical Update 3/26/2022:

Neiko (and Lucy) demonstrated significant improvement in mobility, significant reduction in audible and palpable joint crepitus, and visible signs of pain. Neiko was observed engaging more playfully with his sister and some of the enrichment items provided in their exhibit. The improvement in mobility and overall quality of life was noted by the attending veterinarian, the entire animal care team, and even some regular guests who had gotten to know Neiko and Lucy throughout their stay at Gatorland.

Neiko (and Lucy) lived an additional 18 months past the time when humane euthanasia was initially considered. On 3/26/2022, less than 2 weeks from their 17th birthday, Neiko was humanely euthanized due to sudden renal failure and a sudden neurological episode that significantly compromised his quality of life. Osteoarthritis and mobility difficulties were not causes for this decision.

This case has served to show how beneficial formal physical rehabilitation can be to improve the quality of life of large felines and possibly other animals in captivity that may be suffering from osteoarthritis. It has also served to demonstrate the positive impact of the collaborative work between veterinarians, husbandry and animal care specialists, and physical therapists. This model could be implemented in zoological facilities throughout the United States and the world for the benefit of the animals in their care.

Figure 1. Edriana Fermin and Danielle Lucas with Neiko. Application of PROM during one of Neiko's therapy sessions.



Figure 2. Neiko clearing 4-inch cavaletti poles. Working on endurance and balance.



Special thanks and recognition must be given to Dr. James Bogan, DVM, Danielle Lucas (Animal Care Director), Jessica Bond (Animal Care Manager), Chrissie Thompson (Animal Care Supervisor), and Rachel Smith (Animal Care Lead) for opening their minds to trying something innovative for the benefit for Neiko and Lucy. Without them, this first ever trial of formal rehab with a large feline would not have been possible.

Figure 3. Neiko going up the modified A frame structure. Working on hip extensor strength and endurance.

