To Exercise or Not:
Principles of Canine Rehabilitation

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What is pet rehabilitation?

In humans, physical therapy has been defined as “the science of the application of biomechanics, physics, anatomy, physiology and psychology to persons with dysfunction, injury, pain, or physical abnormalities.” Veterinary physical rehabilitation employs the same techniques used in human physical therapy to achieve one or more of the following functional goals:

- Speed recovery from injury or surgery
- Increase mobility and flexibility
- Improve endurance and agility
- Decrease pain
- Maintain function and prevent further problems
- Enhance quality of life

Rehabilitation offers numerous physiological benefits to patients, including:

- Increased blood flow and lymphatic drainage to the injured area
- Reduction of pain, swelling, and complications
- Increased production of collagen
- Prevention of contractions and adhesions
- Promotion of normal joint biomechanics
- Prevention of other injuries
- Prevention of or reduction in muscle atrophy
- Improved function and quality of movement

How do I know if my patients need physical rehabilitation?

Most animals can benefit from some form of physical rehabilitation. Physical therapy is often used in human medicine to help rehabilitate patients from orthopedic and neurologic injuries and surgeries, and physical rehabilitation is just as beneficial to animals with these conditions. Your patients may also benefit from physical rehabilitation if they are overweight, suffering from chronic pain (i.e., osteoarthritis), or are athletes trying to maintain a high level of conditioning.

What conditions can be improved with rehabilitation?

Some common conditions that may benefit from rehabilitation include:

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What types of equipment and techniques are used in physical rehabilitation?

*Ground Treadmill* – A land or ground treadmill designed specifically for dogs, but can also be used for cats is used to increase strength, balance and proprioception (Figure 1). Both the speed and incline can be adjusted, allowing for a tailored exercise plan. The ground treadmill is an excellent exercise modality for non-painful patients, or for those patients whose pain has been adequately managed.

*Hydrotherapy* – Hydrotherapy, also referred to as an underwater treadmill, relies on the principles of relative density, buoyancy, hydrostatic pressure, surface tension, viscosity and resistance to achieve its therapeutic benefits (Figure 2). These principles have the following implications in aquatic therapy:

- The limbs bear less body weight in water, which reduces the load on painful joints to permit more comfortable exercise
- Water pressure can reduce swelling and edema
- Water resistance is useful for muscle strengthening and cardiovascular training
- The stabilizing and buoyant effects of water enable many patients to perform exercises in water that they cannot do on land

Exercising in water is effective for improving strength, muscular endurance, cardiorespiratory endurance, range of motion, agility, and psychological well-being, while minimizing pain. It is also an excellent form of exercise for weight loss. Many conditions benefit from hydrotherapy, especially those disorders in which an animal is reluctant to use a limb or there is a lack of strength, range of motion, proprioceptive ability or weight-bearing status. An animal that will not use a limb on land will frequently use it in the water. Many underwater treadmills have variable control over speed, resistance and depth, which allows for a tailored and progressive therapy plan for every patient, from Chihuahua to St. Bernard. Some underwater treadmills have jets that can be turned on or off, depending on the amount of resistance desired. Also, this type of treadmill converts to a countercurrent swim tank so patients can benefit from both treadmill and swim therapy.

*Therapeutic Laser Therapy* – Therapeutic laser therapy is a newer advance in veterinary rehabilitation (Figure 3). Unlike high-powered surgical lasers that create a thermal destruction of cells and tissues, the lasers used in rehabilitation are low-powered (up to 10 watts) and help to modulate cellular activity in many different types of tissues. Therapeutic lasers have the potential to accelerate tissue repair and cell growth of structures such as skin, tendons, ligaments and muscles. Laser therapy may help maintain cartilage health during periods of disuse. It also has therapeutic effects in the management of chronic pain. Laser therapy has been used to treat osteoarthritis in humans. Some studies have shown an improvement in peripheral nerve injuries when therapeutic laser is utilized. Laser therapy is noninvasive. There are no reported adverse side effects when it is used properly.

*Massage* – has long been a component of human sports medicine and rehabilitative therapy, and is gaining wide acceptance as a therapy for dogs and cats.
Massage has many benefits:

- Increases blood flow
- Improves oxygen delivery to tissues
- Improves removal of metabolic waste products
- Relieves pain by releasing endogenous endorphins
- Accelerates muscle recovery
- Breaks down adhesions
- Promotes mental and physical relaxation

Massage may have immediate benefits to a patient, but it usually takes regular treatments to bring about significant improvements in a particular condition. It is often used in conjunction with other therapeutic modalities to enhance the effectiveness of those modalities. Massage should only be performed by those specifically trained in animal modalities.

**Neuromuscular Electrical Stimulation (NMES)** – Neuromuscular electrical stimulation is the administration of a low-level electrical current through electrodes placed on the skin to depolarize the motor nerve and produce a skeletal muscle contraction (Figure 5). Neuromuscular electrical stimulation is used for conservative and postoperative treatment of various orthopedic and neurological problems. The goals of NMES are:

- To control acute or chronic pain
- To prevent disuse atrophy
- Muscle strengthening
- Muscle reeducation
- Edema reduction
- Muscle spasm reduction

**Therapeutic Exercise** – Therapeutic exercise is one of the most effective treatment modalities we have. Therapeutic exercise can be used to preserve range of motion and muscle mass, and to challenge healing tissues during recovery.

Passive exercises (passive range-of-motion or PROM) are performed to help maintain or improve joint mobility, improve flexibility of muscles, tendons, and ligaments, and to help enhance awareness of neuromuscular structure and function (Figure 6).

Assisted exercises bridge the gap between completely passive and more active activities. Many of them are proprioceptive exercises that help animals regain their ability to use and place their limbs appropriately. The goals of these exercises are to enhance proprioceptive feedback, encourage weight shifting and muscle contraction, and to facilitate balance and function (Figure 7). Some examples include:

- Assisted standing
- Weight-shifting while standing
- Weight-shifting on exercise ball
- Balance board
Active exercises are voluntary activities that help animals regain strength and function (Figure 8). They are the most beneficial exercises for regaining muscle mass. Some examples include:

- Slow leash walks
- Treadmill walking
- Hill and stair climbing
- Sit-to-stand exercises
- Cavaletti rails
- Pole weaves
- Dancing or wheelbarrowing

**Therapeutic Ultrasound** – Therapeutic ultrasound is the application of sound waves to tissues. The energy from these waves is scattered and then reabsorbed, resulting in localized heating of deep tissues. Ultrasound heats tissues to a depth of 3 cm or more, compared to more superficial methods (e.g., hot packs, heating pads, etc.) that only heat to approximately 1 cm (Figure 9). This is an effective modality for rehabilitating musculoskeletal conditions such as restricted range of motion resulting from joint contracture, pain and muscle spasm, and wound healing.

**Thermotherapy** – Thermotherapy is the use of cold (cryotherapy) and/or heat over an injured area of the body. Cryotherapy is typically used alone during the first 24 – 72 hours post-surgery or injury (the acute inflammation period). After that, it is often used in conjunction with heat therapy. Cryotherapy has the following benefits:

- Decreases pain (by decreasing the nerve conduction velocity)
- Decreases inflammation
- Causes a localized decrease in blood flow followed by an increase in blood flow

Superficial heat therapy is typically used after the first 2 – 3 days post-injury. It is often used in conjunction with cryotherapy. It has the following benefits:

- Increases blood flow and decreases pain
- Increases enzyme activity (which speeds healing)
- Increases muscle contractility and stretching capability

Heat therapy should not be used during the acute inflammatory phase of an injury (first 72 hours).

**What conditions can be treated with physical rehabilitation?**

There are many conditions that can be improved with physical rehabilitation. Some of the most common include:

**Degenerative Myelopathy** – Degenerative myelopathy is a progressive disease of
the spinal cord that results in hind limb weakness, ataxia (lack of coordination), and eventual paralysis. Rehabilitation cannot cure this disease, but it can help keep a dog as strong and comfortable as possible. Therapeutic exercises, the underwater treadmill/swim tank and massage are frequently used for this condition.

**Fibrocartilaginous Embolism (FCE)** – Fibrocartilaginous embolism is a condition in which the blood supply to the spinal cord is interrupted, resulting in an acute onset of severe neurological deficits, including paralysis. The rate and extent of recovery depends on the degree of injury to the spinal cord. Most patients who are going to recover from this condition show some signs of improvement in the first two weeks after the injury. Rehabilitation is critical during this time to help ensure a good outcome. Therapeutic exercises, the underwater treadmill/swim tank, electrical stimulation and massage are frequently used to rehabilitate patients with this condition.

**Hip Dysplasia** – Hip dysplasia is a malformation of the hip joint and is the leading cause of hip osteoarthritis. Options for surgical intervention include total hip replacement, femoral head ostectomy and triple pelvic ostectomy. Rehabilitation is frequently used post-surgically to help ensure a good outcome. It is also beneficial for management of this condition without surgical intervention, in the event that a dog is not a good candidate for surgery. The underwater treadmill, therapeutic exercises, pain management, laser therapy and massage are frequently used for rehabilitating this condition.

**Intervertebral Disc Disease** – Intervertebral disc disease, the protrusion or extrusion of one or multiple discs between the vertebrae, is a common cause of weakness and back pain in dogs. Major trauma can cause an acute extrusion of disc material, but it is more likely to be secondary to an underlying degeneration of the disc. The two types of disk degeneration are *chondroid degeneration* (most common in Dachshunds, Pekingese and cocker spaniels) and *fibroid degeneration* (most common in older, large-breed dogs). Chondroid degeneration often results in an acute extrusion of disc material (type I extrusion), while fibroid degeneration results in a slower, more progressive extrusion (type II protrusion). The clinical signs are usually less severe and have a slower onset compared to type I extrusions. Therapeutic exercises, electrical stimulation, massage, the underwater treadmill/swim tank, pain management and acupuncture are frequently used for rehabilitating this condition.

**Osteoarthritis/Degenerative Joint Disease (OA/DJD)** – Osteoarthritis is the most common cause of chronic pain in dogs and cats. It is the loss of cartilage within a joint. The gradual decrease of this protective cartilage can result in painful bone-on-bone contact and a thinning of the synovial fluid that helps cushion the joint. The underwater treadmill, therapeutic exercises, pain management, thermotherapy, laser therapy and massage are frequently used for managing this condition.

**Post-Surgical Rehabilitation** – Rehabilitation after surgery is critical to helping a patient return to normal activity with minimal complications. Rehabilitation can help relieve pain and reeducate the patient to walk normally. Rehabilitation is also important to prevent further injury to the affected limb, or to the rest of the body
that has been compensating for the loss of function of the injured limb. Multiple treatment options may be used, depending on the type of surgery and where the patient is in his/her recovery process.

**Sports Injuries** – Sports injuries (strains, sprains, muscle soreness) are common in athletic and working dogs. Physical rehabilitation is ideally suited to returning animals with these conditions back to work and competition safely and in the shortest time possible. The underwater treadmill, therapeutic exercises, pain management, therapeutic ultrasound, laser therapy and massage are frequently used.

**Weight Loss** – Painful conditions, especially those involving the musculoskeletal system (such as osteoarthritis), are complicated by obesity. Being overweight by even 10% can be the difference between a pet having comfort and one continuing to be painful and potentially suffering. A rehabilitation practitioner can help develop a comprehensive, scientifically based weight loss program to help you help pets lose weight. Practitioners work with owners to achieve mutually agreed-upon goals to help pets lead a more comfortable, healthier life.

**Suggested Reading**


Impellizeri JA, Tetrick MA, Muir P. Effect of weight reduction on clinical signs of


Photos for Figure 7 and Figure 8 provided by Robin Downing, DVM, DAAPM.