Evidence for Canine Rehabilitation and Physical Therapy

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- Canine rehabilitation • Physical Therapy • Evidence-based medicine
- Musculoskeletal tissue disuse • Outcome assessment
- Therapeutic and aquatic exercises • Physical modalities
- Orthopedic rehabilitation • Neurologic rehabilitation

KEY POINTS

- Cartilage, muscle, tendons, ligaments, and bone undergo atrophy with decreased limb use. Appropriate rehabilitation of musculoskeletal conditions must incorporate this knowledge to safely remobilize and strengthen these tissues.
- The ideal outcome assessment instrument should be objective, easy to apply, inexpensive, noninvasive, and, most important, able to discriminate the effectiveness of treatments.
- Therapeutic and aquatic exercises, heat, cold, therapeutic ultrasound, electrical stimulation, therapeutic laser, extracorporeal shock wave, and pulsed electromagnetic fields have all been used in veterinary rehabilitation and have benefit.
- Research indicates that rehabilitation is useful for the treatment of various orthopedic and neurologic conditions.

Rehabilitation and physical therapy of companion animals are among the fastest growing branches of veterinary medicine. The scientific evidence regarding the efficacy of canine rehabilitation and physical therapy is relatively small, but that body of literature is growing. Twenty years ago, there was scant anecdotal information regarding rehabilitation in animals, and in particular, dogs. Most of the early literature pertaining to canine rehabilitation was based on the dog as a model for physical therapy in people. This information is important, yet it is often found in journals related to human physical therapy, and exercise and sport science. Fortunately, the advent of computer-based databases has increased the accessibility of these sources. Others

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have extrapolated information determined in human beings undergoing physical therapy, but these results may or may not apply to animals. Yet, it may be the best available information. Today, there is growing interest in answering not only the question, "Does it work?", but also "How does it work?", and "How much benefit is there?" Importantly, there is growing interest among surgeons, internists, neurologists, and members of the newly formed American College of Veterinary Sports Medicine and Rehabilitation. Clinicians involved with rehabilitation are challenged to ask questions related to canine rehabilitation and physical therapy, but more important, to find the answers through new research.

RESPONSES OF TISSUES TO DISUSE AND REMOBILIZATION

The responses of musculoskeletal tissues to disuse and remobilization in dogs and other animals have been reviewed.[1] This article reviews some of the important studies regarding dogs. It is obvious that if bones, cartilage, muscles, ligaments, and tendons are not loaded and used, atrophy occurs. The more important questions are "How much atrophy occurs?", and "Over what time frame do atrophic changes occur?" Equally important are the questions, "How can tissues be safely remobilized and strengthened" and "How long will it take to regain the lost tissue integrity?"

Cartilage

Chondrocytes, proteoglycans, collagen, and water are the main components of articular cartilage, and each plays a unique role in maintaining the structure and function of cartilage. With disuse or immobilization of joints, there is cartilage atrophy and thinning of articular cartilage, decreased synovial fluid production and distribution, diminished delivery of oxygen and nutrients to cartilage, reduced proteoglycan content and synthesis, and decreased cartilage stiffness. For example, 3 to 11 weeks of immobilization of a stifle joint in flexion results in 13% to 60% reduction of proteoglycan content in young dogs, and cartilage thickness may be reduced 9% to 50%.[2,3] In addition, the method of joint immobilization affects cartilage. If joints are immobilized in flexion without weight bearing, cartilage atrophy occurs. Conversely, if joints are immobilized in extension and weight bearing is allowed, the joint may undergo degenerative changes. In any case, joint immobilization is not desirable. However, there are clinical situations that require joint immobilization. Knowledge of the changes that occur with immobilization and the time course of events helps in the development of a rehabilitation program to improve tissue integrity.

The length of immobilization, condition of cartilage, and the length and magnitude of weight bearing after immobilization affect cartilage recovery. After 6 weeks of immobilization, 3 weeks of free, low-intensity activity resulted in normal cartilage in 1 study.[4] Longer periods of immobilization likely require longer recovery times. For example, immobilization for longer than 15 weeks may not result in complete recovery, even with 50 weeks of remobilization, in young dogs.[5] Vigorous exercise after immobilization may be deleterious to cartilage. In 1 study, jogging young dogs 9.5 km/d at 5 km/h after immobilization for 3 weeks resulted in continued decreases in cartilage thickness (20%) and proteoglycan content (35%), even though proteoglycan synthesis increased (16%).[6]

Bone

Situations that prevent or reduce weight bearing on a limb result in reduced cortical and cancellous bone mass, cortical bone density and stiffness, and increased turnover in cancellous bone.[7,8] The changes that occur after immobilization vary