

## **Evidence Based Physiotherapy**

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### **History of Physiotherapy in Canada**

Human physical therapy in Canada began in and around the First World War, when large numbers of wounded servicemen began arriving back home from overseas and found themselves unable to cope with life's demands. Intensive one-year physical therapy training courses were set up in 1916 as the nation realized that medical care and surgery were not enough to restore severely wounded men into healthy, functional members of society. Physical therapists in those days administered light and heat therapy, as well as hydrotherapy, electrical treatments, massage, and passive, active and resisted exercises. These early physical therapists were registered and monitored by the Canadian Association of Massage and Remedial Gymnastics (a forerunner of the Canadian Physiotherapy Association – CPA) for the maintenance of high standards of education, quality of treatment, and professional conduct. As demand grew, educational advances progressed, and the first school of physiotherapy was established in 1929 at the University of Toronto, offering a two-year diploma course. McGill University offered the first baccalaureate degree in 1954, but it was not until the 1970's that the 3 to 4-year baccalaureate degree was established as the minimum educational requirement in order to practice physiotherapy on human patients. The current entry-level educational requirement for a physical therapist to practice in Canada is a 2.5-year full time, year-round Masters degree (following a prerequisite Bachelors degree), and by 2020, all university physical therapy programs will change their curriculum to a Doctorate in Physical Therapy (DPT), which will be the minimum educational requirement for an entry level physical therapist. The 3+ year DPT is currently being offered in the United States and transitional-DPT courses are available for practicing therapists who want to upgrade to this degree). Newly graduated physiotherapists (a term widely accepted as being interchangeable with the title of physical therapist) possess extensive knowledge and understanding in human anatomy, physiology, psychology, orthopaedics, manual therapy (soft tissue mobilization, and joint mobilization, manipulation, and stabilization), kinetics, bio-mechanical sciences, neurology, cardio-respiratory sciences, therapeutic techniques and tools, and exercise prescription. In addition, recent physiotherapy graduates are adept in client health management and case management, as well as in research evaluation, design, and implementation. Currently in the field of human physical therapy, a professional competency exam must be passed upon graduation, and continuing education is a mandatory requirement for licensure. Most physical therapists seek to expand their knowledge in a specialized area of their profession by means of continuing education opportunities. Some of these special interests are reflected in (but not limited to) the official divisions of the CPA: orthopaedics, sports, neurosciences, cardiorespiratory, women's health, private practice, leadership, acupuncture, seniors' health, paediatrics, international health, pain sciences, oncology, and animal rehabilitation. Human patients in Canada have direct access to physical therapist in private practice settings, in other words, they do not require a physician's referral to be able to seek services from a physiotherapist. Regardless of this autonomy of practice, physical therapists continue to work collaboratively with medical doctors and other allied health care professionals in order to ensure that all aspects of a patient's health care are addressed in a patient-centred model of care provision. Physical therapists are authorized and capable of making a clinical diagnosis prior to administration of treatment. In hospital settings, physiotherapists treat patients by physician referral due to practical and policy reasons, but they also carry out physical diagnoses, establish problem lists, and set therapy goals and treatment plans. Physical therapist diagnoses are often of a different nature than those of medical doctors (or veterinarians), and may include our

impression of muscle imbalances, joint or spine dysfunctions, identification of specific soft tissue lesions, and the creation of a list of functional impairments to be addressed in treatment.

### **History of Animal Rehabilitation in Canada**

The Animal Rehab Division of the Canadian Physiotherapy Association, formerly named The Canadian Horse and Animal Physical Therapists Association (CHAP), was first established in 1994 as an organized group of physical therapists interested in using their professional skills to treat animals. In 1994, CHAP was the third such group of its kind in the world, following the lead of Great Britain in 1984 and the Netherlands in 1989. In 2004, the Animal Rehab Division was officially recognized as a special interest group of the CPA. Currently, there are 12 countries with animal physiotherapy groups/divisions which form part of their national physiotherapy association. Other countries include South Africa, Sweden, Spain, Finland, Australia, the United States, Switzerland, Ireland, and Belgium. All of these animal physiotherapy associations fully recognize that additional educational is necessary for a physical therapist to engage in the practice of animal rehabilitation. Each of these countries has (or is) taken the initiative of creating its own educational system and setting of standards to train physical therapists in animal rehabilitation / physiotherapy / physical therapy. In North America, there are three certification programs available to train physiotherapists to apply their skills to animal patients. The two existing programs in the United States are offered to physical therapists, veterinarians, and animal health technicians or equivalent. These programs attempt to bolster the different aspects of knowledge of each professional group of students. The Canadian animal rehabilitation program (offered by the Animal Rehab Division of the CPA) limits its enrolment to physiotherapists, and focuses entirely on teaching this single group of professionals, animal principles (mostly canine and equine) such as anatomy, biomechanics, pathology, clinical conditions, common veterinary surgical and clinical interventions, and handling skills, as well as physiotherapy assessment and treatment techniques for these species. England (and previously Australia) boasts the world's only post-graduate (Masters) degree programs. In the case of The Royal Veterinary College in England, the program offered is a Master of Science in Veterinary Physiotherapy, whereas at the University of Queensland in Australia, the program previously offered a Masters of Animal Studies in Animal Physiotherapy. The Australia program is currently not running and is proposed to be re-established at another university. These courses have limited their enrolment to physiotherapists, and are two-year course-based programs with a research component and a publishable clinical thesis requirement. No similar university level program currently exists in North America, and only a handful of North American physical therapists have completed either one of these Masters programs abroad.

The type of clinical practice in the field of animal rehabilitation is quite diverse. In general, physical therapists have established collegial partnerships with veterinarians throughout North America. Some therapists work out of veterinary clinics, others do house-calls (or barn-calls), some have a home-based office/barn, and others operate businesses or are employed by stand-alone rehabilitation referral centres. Regardless of the type of clinical setting, the Animal Rehab Division strongly advocates that rehabilitation of animals be provided by properly trained physical therapists upon veterinary referral if an animal is lame, injured, or requires post-surgical services. Physiotherapy in the human health care field is often complimentary to other health care services, and the Animal Rehab Division believes that it is with this same professional approach and conduct that animal rehabilitation should be delivered. Members of the Division can obtain professional liability insurance specific to the treatment of animal patients, and the Division encourages direct communication between the referring veterinarian and the physiotherapist providing animal rehabilitation services to their patients in order to ensure that both professional health care providers are aware of the clinical conditions, advisements, treatments, and/or prescriptions provided by the other. At the present time, the practice of animal rehabilitation is not regulated by any Canadian provincial physiotherapy regulating group. For this reason, the Animal Rehab

Division is in favour of discussions with various provincial veterinary regulatory bodies, to work towards the establishment of guidelines for the delivery of animal rehabilitation by physical therapists in order to provide the best and most professional services possible to ensure the well being of animal patients. At this time, the terms and titles of physiotherapy / physical therapy and physiotherapist / physical therapist are restricted to licensed physiotherapists engaged in the practice of human physical therapy, and hence the term animal rehabilitation is currently used to describe the practice of physical therapy in animals. However, the term animal rehabilitation is not a protected term, and lay persons engaged in massage, chiropractic, and aquatic therapy have been applying this term to their practices, causing confusion for the public as well as for referring veterinarians.

Veterinarians and veterinary technicians have entered the field of animal rehab as well. Some utilize their rehab training to provide rehab services to their own patients, to referred patients, and some vets find the rehab training enables them to provide a more thorough musculoskeletal evaluation and some additional knowledge to prescribe advice or exercise therapies to their regular clients. Animal rehab is being included at veterinary conferences internationally, and especially in the USA, where there is even discussion of adding Animal Rehab as a potential boarded specialty in the future. As well, the International Veterinary Academy of Pain Management felt that rehab was such an important part of pain management, that they have instituted a component of their certification exam process that encompasses knowledge of rehab, and they have invited and welcomed physical therapists to become members of their organization.

As advances in veterinary medicine take place and as more refined diagnostic tools and techniques become available to animal patients and more sophisticated surgical techniques are developed, greater emotional and financial investments are generally placed on animal 'family members' in our society. Therefore, expectations of longer animal life-spans and increased quality of life are being demanded by the general public. The addition of animal rehab and alternative therapies to the more traditional veterinary medicine practices for the treatment of animal patients appears to be an important step towards improving the overall quality of life and life-span of these animals.

### **So What Can Human Physiotherapy Research Tell Us?**

When searching the literature for 'physiotherapy' or 'physical therapy', it is hard to find evidence for its use, however, when one searches different specific techniques or interventions (assessment or treatment, etc), then the research that underpins physiotherapy practice becomes more evident. Physiotherapy can be broken down into categories and subcategories. If we use the CPA Divisions as categories of practice (i.e. Orthopaedics, Neurosciences, Cardiorespiratory, etc), then we can further divide these into the subcategories of therapies or skills provided. For the purpose of time management, this lecture will cover only therapies addressed in the practice of orthopaedic physical therapy. These can include, but are not limited to, manual therapies, exercise prescription, and modalities. Other forms of orthopaedic treatments (not discussed within this lecture) can include fitting of assistive devices (splints, slings, or bandaging), biomechanical analysis (work place or sporting), acupuncture and dry needling, or first-responder duties (in the terms of sports physiotherapy) to name a few.

#### *Manual Therapy*

Manual therapy is actually a very broad topic itself. Included within this spectrum, are mobilization, manipulation, traction, range of motion, stretching, trigger point release / myofascial release, massage, and occasionally various osteopathic techniques (i.e. craniosacral therapy).

Mobilization and manipulation are often categorized together, while a manipulation is a high velocity low amplitude thrust, a mobilization is a gentler coaxing of a movement by passive rhythmical oscillations performed at the beginning, within or at the limit of range. Both techniques are generally utilized for the treatment of joint stiffness and/or joint pain (spinal or extremity). (Maitland et al 2005) Bronfort et al (2004) conducted a systematic review on the efficacy of spinal manipulation and mobilization for low back pain and neck pain and concluded that recommendations can be made with some confidence regarding the use of spinal manipulative therapy and/or mobilization as a viable option for the treatment of both low back pain and neck pain. However this paper and many others have stated that future studies need to be conducted on homogenous sub-classifications of neck or back pain patients. Not all spinal pain is the result of the same type of lesion, so to treat all lesions with just one treatment technique is bound to yield mixed and inconclusive results. Flynn et al (2002) studied a clinical prediction rule for identifying patients with low back pain: duration of symptoms less than 16 days; absence of symptoms below the knee; a Fear Avoidance Beliefs Questionnaire work score of less than 19; lumbar segmental hypo-mobility (as judged by downward pressure on the spinous process; and greater than 35 degrees of hip medial rotation in at least one hip. When these factors were taken into consideration (four of five of these variables), then the probability of success with manipulation went from 45% to 95% within one week of intervention! This clinical prediction rule was further validated by a randomized controlled trial by Childs et al (2004). The moral of the story is that if you manipulate all patients with spinal pain, you get so-so results, but if you manipulate the 'right' patients, you can get great results. Physical therapy research has recently shown very positive results in demonstrating prescriptive validity for a Treatment Based Classification system. The resulting treatment classification subgroups were specific exercises, manipulation, stabilization, and traction. Fritz and Brennan (2007) reported a Treatment Based Classification for neck pain, which categorized neck pain into groups of mobility, centralization, exercise and conditioning, pain control and headache. While this information is promising, more studies are needed.

Traction is a common technique employed for the treatment of disc disease in humans. Randomized controlled trials (RCT) on traction are frustrating to read. Again, unless patients with spinal pain are subclassified, then results are always inconclusive. Fritz et al (2007) found that patients that responded to lumbar traction are characterized by the presence of leg symptoms, signs of nerve root compression, and either peripheralization with extension movements or a crossed straight leg raise. Traction may have an important role in breaking the "cycle of pain" in cervical radiculopathy caused by herniated discs. The cycle begins when nerve roots are entrapped within the intervertebral foramina. Irritated nerves produce a reflex response to the patient's cervical muscles, causing those muscles to contract, further narrowing the foramina and increasing neck pain. Intermittent traction helps relieve the inflammatory reaction of nerve roots by improving the circulation and reducing swelling to surrounding tissues. Gentle alternations of stretching and relaxation of soft tissue structures (such as with gentle traction) in the neck prevent the formation of adhesions of the dural sleeve. Human patients with radiculopathy symptoms lasting more than 12 weeks show less favourable improvements with traction, and early intervention is believed to be more successful. Exposure of a herniated disc material in the cervical spine (C/S) to the vascular environment of the epidural space contributes to its resorption and regression. Large extruded discs have wider exposure to resorption mechanisms and tend to regress more rapidly. The response to early therapeutic intervention in cases where there is a large extruded disc is therefore more favourable (Constantoyannis et al 2002; Malanga & Nadler 1999). Treatment protocols that include traction appear to be highly effective in individuals with lumbar pain related to a confirmed herniated lumbar disc with radiculopathy. Reports indicate that a treatment protocol which partly included traction as well as other physiotherapy interventions resulted in 90% good or excellent outcome and a 92% return-to-work rate in 64 patients with CT scan-proven herniated lumbar disc and

EMG-proven radiculopathy (Sal & Saal 1989). In another study, lumbar traction was most likely to be beneficial in patients with acute radicular pain of less than 6 weeks duration and concomitant neurological deficit (Krause 2000). As well cervical traction has been shown to have a positive impact (in combination with electrotherapy) in patients with radiculopathy. (Joghataei et al 2004)

Stretching and range of motion have been shown to be effective in increasing joint mobility about the knee, hip, trunk, shoulder and ankle joints including muscle length/flexibility. (Davis et al 2005; Decoster et al 2005; Knudson D 1999; Magnusson et al 1998; Power et al 2004; Thacker et al 2004.) Studies have shown that regular muscle stretching can improve eccentric and concentric force production, velocity of contractions, maximal volitional contractions, countermovement jump height, 50 yard dash and athletic performance. (Hunter & Marshal 2002; Shrier 2004) One animal study even found that regular stretching can induce hypertrophy in immobilized muscles and another speculated that this effect may improve performance in the long term. (Coutinho et al 2004; Shrier 2004) Crook et al (2007) found that Labrador retrievers demonstrated a goniometric increase in osteoarthritic joint range of motion utilizing daily passive stretching. Technique may impact efficacy, as Meroni et al (2010) found that active stretching exercise was more effective than static stretching for increasing flexibility and maintaining the flexibility gains. A study on racing greyhounds found that dogs that had received race training had greater flexibility, possibly due to training having an active stretching role on muscles, tendons and other structures limiting the hip range of motion. (Nicholson et al 2007) Poor muscle flexibility has been equated with human knee injuries (Messier et al 2008) and reduced preseason hip and knee range of motion has been correlated with a statistically higher risk for a muscle strain injury in soccer players. (Bradley & Porta 2007) There are no systematic reviews or RCTs that investigate the use of stretching as a stand-alone treatment for tendinopathies, muscle strains, or myofascial pain syndromes although its use is common in clinical settings.

Additional muscle therapies may include trigger point/myofascial release and/or massage. Myofascial trigger points (MTrP) have been described as "...a hyper-irritable spot in skeletal muscle that is associated with a hypersensitive palpable nodule in a taut band. The spot is tender when pressed, and can give rise to characteristic referred pain, motor dysfunction, and autonomic phenomena..." (Simons et al 1999) Several possible mechanisms can lead to the development of MTrPs, including low-level muscle contractions, uneven intramuscular pressure distribution, direct trauma, unaccustomed eccentric contractions, eccentric contractions in unconditioned muscle, and maximal or submaximal concentric contractions. (Dommerholt et al 2011) Research has shown there is an increase in muscle activity, as recorded on EMG, in active myofascial trigger points. (Kuan et al 2007) Furthermore, muscles with active trigger points show changes in biochemical markers – increases in substance P, calcitonin gene-related peptide, bradykinin, interleukin-6, interleukin 1 $\beta$ , tumor necrosis factor- $\alpha$ , serotonin, and norepinephrine, and decreases in pH. (Shah et al 2008; Shah et al 2005) Using clinical diagnostic methods (tender spot / pain on palpation within a taut band), one canine study described the presence of trigger points specifically in the quadriceps, pectineus, iliocostalis lumborum, semitendinosus, semimembranosus, tensor fasciae latae, gluteus medius muscles and triceps brachii. (Janssens 1991) This author would add iliopsoas, sartorius, deep gluteal, as well as teres majors, latissimus dorsi and rhomboideus to this list based on clinical findings. Physical therapy interventions for myofascial pain involve multiple techniques including manual therapy, exercise, ultrasound, transcutaneous electrical nerve stimulation (TENS), electrical muscle stimulation, dry needling, laser, and usually always stretching. Table 1 shows manual therapy treatment options for myofascial pain.

<b>Treatment technique</b>	<b>Finding</b>	<b>Reference</b>
Stretching	Passive stretching along with fluoromethane vapocoolant spray decreased pain and increased pressure pain threshold in people with myofascial pain (uncontrolled study)	Jaeger & Reeves 1986
Dry Needling	Dry needling combined with active stretching exercises produced greater reduction in pain compared to active stretching alone or a no-treatment control.	Edwards & Knowles 2003
Ischemic pressure	Ischemic pressure of a myofascial trigger point when combined with active ROM exercises has an immediate effect on reducing pain, increasing pressure pain threshold and tolerance and improving range of motion Both ischemic pressure and transverse friction massage significantly reduce pain intensity	Hou et al 2002  Fernández-de-las-Peñas et al 2006
Massage	Both Thai massage plus stretches and Swedish massage plus stretches show significant reductions in pain and disability measures	Chatchawan et al 2009
Combined Therapies	Hot packs and active ROM showed significant increases in pain thresholds and tolerance and a small decrease in pain.  Adding ischemic pressure or spray and stretch to the hot packs and AROM showed similar increases in pain threshold and tolerance but a greater decrease in pain  Adding TENS or interferential current to the hot packs and AROM similarly increased pain threshold and tolerance and resulted in a further decrease in pain	Hou et al 2002

### *Modalities*

Several modalities exist in physical therapy practice. Some of the more commonly utilized modalities are laser, ultrasound, electrical muscle stimulation, TENS, and pulsed electromagnetic field therapy.

Low-level laser therapy (LLLT) uses laser light to aid tissue repair, relieve pain, and stimulate acupuncture points.(Woodruff et al 2004; Enwemeka et al 2004; Siendentopf et 2002) It's general effectiveness can be attributed to anti-inflammatory mechanisms (which can be similar to pharmacological agents such as celecoxib, meloxicam, diclofenac and dexamethasone), the ability to reduce oxidative stress, improved angiogenesis, augmentation of collagen synthesis, and skeletal fatigues and inhibition of transmission a the neuromuscular junction.(Bjordal et al 2006; Chow et al 2009) Research into the use of LLLT for pain reduction and tissue repair spans more than 30 years, but only more recently have high quality reviews and meta-analyses been able to elucidated details on laser types and dosages that yield positive results. Chow et al 2009 revealed that for acute and chronic neck pain, the optimum dose per point for an 820-830nm laser was 5.9 Joules with an irradiation time of 39.8 seconds and using a 904nm laser, it was 2.2 Joules delivered with an irradiation time of 238 seconds. The number of repetitions and treatments per week were variable. Data from the reviewed trials suggested that positive effects were immediate and could be maintained for up to 3 months after treatment ended. Bjordal et al 2006 determined that LLLT at high doses (7.5 J/cm<sup>2</sup>) at the target tissue

in the first 72 hours (to reduce inflammation) followed by the lower doses (2 J/cm<sup>2</sup>) at target tissues in subsequent days (to promote tissue repair) was most advisable. Each of these two authors noted that studies that reported negative results, also utilized inadequate doses, and poor laser exposure technique. As well, systematic reviews that did not employ procedural assessment of factors, such as dosage and exposure technique, should be disregarded.

Ultrasound is by far the most widely used physical agent currently available to clinicians in the US, Canada, Australia, England, and the Netherlands.(Belanger 2003) Ultrasound studies are also plagued with dosage and parameter insufficiencies. Alexander et al 2010 determined that studies that showed beneficial effects of ultrasound for shoulder pathologies typically had 4 times longer total exposure times and applied much greater ultrasound energy per session compared with studies that showed no benefit of ultrasound. A Cochrane Review paper concluded that ultrasound yields significant benefits to the healing of leg ulcers (Al-Kurdi et al 2008), and therapeutic ultrasound may have an effect on pain and loss of function in osteoarthritis. (Rutjes et al 2010) On the other hand, evidence for the effect of low intensity pulsed ultrasonography on healing of fractures is moderate to very low in quality, however overall results are promising.(Busse JW et al 2009) Additionally, there has been some encouraging results with low intensity pulsed ultrasound to promote healing in various soft tissues such as cartilage, inter-vertebral disc, and teno-osseous junctions, but the role of low intensity pulsed ultrasound in treating tendinopathies is questionable.(Khanna et al 2009)

Electrical muscle stimulation is used in clinical practice to strengthen muscle. However one research review has shown that use of electrostimulation is less effective on its own as compared to a superimposed or combined therapy with active exercise.(Dehail et al 2008) As well, for strength gains, it yields no higher benefits than traditional strengthening methods. The use of neuromuscular electrical stimulation to prevent muscle atrophy associated with prolonged knee immobilisation following ligament reconstruction surgery or injury has been extensively studied. NMES has been shown to be effective in preventing the decreases in muscle strength, muscle mass and the oxidative capacity of thigh muscles following knee immobilisation. (Lake 1992) In animals, the primary use is the treatment of muscle atrophy, to underpin re-education of muscle function, and muscle strengthening. (Baxter & McDonough et al 2007) Rodent studies have identified morphological and histological properties of muscle with the use of electrical stimulation to prevent muscle atrophy. Boonyarom et al 2009 concluded that low-intensity, low-stimulation frequency (20Hz) could prevent atrophy of slow-twitch muscle fibers, and that short periods of low-intensity, high-stimulation frequency (30Hz) could prevent atrophy in fast-twitch muscle fibres. Dupont Salter et al (2003) revealed that remediation of disuse atrophy may be accomplished using unphysiologically low rates of motor-unit activation (2 Hz and 10 Hz).

Transcutaneous electrical muscle stimulation (TENS) is a modality utilized for pain relief. The two main mechanism by which electrostimulation produces pain relief are segmental inhibition through pain-gating mechanisms, and via descending inhibitory mechanisms. Animal models have produced studies that demonstrate that different frequencies of TENS produce analgesia through action on different neurotransmitters and receptors.(Sluka & Walsh 2009) Essentially high frequency / conventional TENS (>60Hz)relies on the selective stimulation of larger diameter fibres in peripheral nerves, which in turn helps to 'block' nociceptive activity in smaller afferents at segmental levels.(Baxter & McDonough 2007) High-frequency TENS increases the concentration of B endorphins in the bloodstream and cerebrospinal fluid, and increases methionin-enkephalin in the cerebrospinal fluid, in human subjects. Both animal and human studies show that high-freq TENS also reduces release of the excitatory neurotransmitters glutamate and substance P in the spinal cord dorsal horn in animals with inflammation.(Sluka & Walsh

2009) Low frequency TENS (<10Hz) stimulates a release of endogenous opiates, and is often referred to as acupuncture-like TENS because its mechanism of pain relief is similar to acupuncture. Essentially low frequency TENS primarily affects the relevant spinal segmental level, where opioid, GABA, serotonin, and muscarinic receptors are activated by low-frequency TENS to reduce dorsal horn neuron activity, nociception and the consequent pain. (Baxter & McDonough 2007; Sluka & Walsh 2009) It has also been shown that peripheral opioid receptors are also responsible for low-frequency (but not high-frequency) TENS analgesia.

Pulsed Electromagnetic Field Therapy (PEMF) is a greatly debated therapeutic tool in physical therapy practice. One review counselled readers to be wary of funding biases in PEMF studies.(Kroeling et al 2009) Conflicting results exist for its use in the treatment of osteoarthritis pain. (Hulme et al 2002; McCarthy et al 2006) However Vavken et al (2009) reviewed relevant RCTs and concluded that PEMF improved clinical scores and function in patients with osteoarthritis of the knee. Individual research can be found to support the use of PEMF in bone healing, pain relief, spinal cord contusion, and tendon healing. (Ibiwoye et 2004; Cheing et al 2005; Crowe 2003; Lee 1997)

### *Exercise Therapy*

General aerobic exercise has been demonstrated to produce hypoalgesia in healthy subjects (animal and human). However, duration and intensity of exercise is important (75% of VO<sub>2</sub> max for 30 minutes) to achieve these results, and animals that run more (spontaneously) have higher thresholds compared with animals that run less.(Bement 2009) However, in chronic muscle pain, low-intensity exercise produces hypoalgesia through activation of the opioid system.(Bement & Sluka 2005) Strengthening exercises can be performed at a lower intensity than aerobic exercise to produce hypoalgesia. Systematic review show that exercise is beneficial for a variety of pain conditions including neck pain, chronic low back pain, pelvic pain, osteoarthritis, patellofemoral pain, intermittent claudication, fibromyalgia, rheumatoid arthritis, and tendonitis.(Bement 2009)

Specific strengthening and exercise prescription is a keystone in physiotherapy practice. A meta-analysis showed that pre- and in-season neuromuscular training with an emphasis on plyometrics and strengthening exercises was effective at preventing ACL injury in female athletes.(Yoo et al 2009) Strengthening exercises, specifically, have been shown to be efficacious for hip osteoarthritis. (Hernandez-Molina et al 2008) Exercise combined with mobilization/manipulation, and exercise alone demonstrated either intermediate or long term benefits for mechanical neck disorders.(Gross et al 2007)

### **The Expanding Role for Physiotherapists in Human Health Care**

Physical therapists have evolved their role as movement specialists.(Studer 2007) Studies have shown the benefits of pre-operative physiotherapy before total hip replacement or total knee arthroplasty to reduce hospital length of stay and modifying discharge conditions, and accelerated early functional recovery of patients immediately after total hip replacement.(Coudeyre et al 2007; Vukomanovic et al 2008) It is becoming more common for advanced practice physiotherapists to take on additional duties beyond those of a regular physiotherapist in order to screen patient pre- and post-operatively, triage patients for surgery, prescribe conservative management and monitor patients on an ongoing basis.(Aiken et al 2009) One Canadian study reported that advanced practice physiotherapists can effectively manage over 30% of patients referred to a surgeon for hip or knee replacement surgery because these patients do not require surgery; rather, they require conservative management.(Aiken et al 2009) An Australian study found that nearly two-thirds of patients with non-urgent musculoskeletal



conditions referred by their GPs to one public outpatient orthopaedic department did not need to see a surgeon at the time of referral and were appropriately assessed and managed by experienced, qualified physiotherapists.(Oldmeadow et al 2007) Another Canadian study evaluated agreement between physiotherapists and orthopaedic surgeons for management of patients with hip and knee problems.(MacKay et al 2009) The researchers found that there was an agreement in 91.8% of cases, and in discordant cases, the physiotherapists tend to refer for consultation. Patients with hip and knee pain referred to orthopaedic surgeons can be appropriately referred for orthopaedic consultation by physiotherapists working in extended roles.

## Conclusion

Physiotherapy is a profession, with a history of collaboration within the medical community. It strives to provide evidence-informed therapies and treatments and is active in research and knowledge translation. Physiotherapists are practicing in advanced roles in human practice and are contributing in meaningful ways to the expansion of veterinary medicine. Physical therapists are not only practicing animal rehabilitation collaboratively within the veterinary industry, but are leaders in educating veterinarians, veterinary technicians, physical therapists, and physical therapy assistants in how to practice animal rehabilitation. (Edge-Hughes 2009) Both physical therapists and veterinarians with training in animal rehabilitation are enhancing the health and well being of animals.

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