



FELINE PHYSIOTHERAPY AND REHABILITATION

1. Principles and potential

Brian Sharp

Practical relevance:

Physiotherapy is highly valued within human medicine and relatively well established for canine patients. Despite a popular misconception that feline patients will not cooperate with such treatment, physiotherapy is now increasingly being performed with cats. With cat ownership increasing in many countries, and an emergence of specialist physiotherapy practitioners, there is demand for effective postoperative and post-injury rehabilitation for any cat with compromised physical function due to injury, surgery or disease.

Clinical challenges: While physiotherapy and rehabilitation are potentially beneficial for cats, due to their independent nature feline patients certainly present a greater challenge in the pursuit of effective therapy than their canine counterparts.

Audience: This two-part review article is directed at the primary care veterinary team. The benefits of physiotherapy and the various treatment modalities available to the qualified veterinary physiotherapist, as well as the non-specialist veterinarian and veterinary nurse or technician, are examined in this first part.

Evidence base: The benefits of human physiotherapeutic intervention are well documented, and there is good evidence for the effectiveness of most treatment modalities. Animal studies are still in their infancy, although some preliminary studies in dogs have shown good results.



The rise of animal physiotherapy

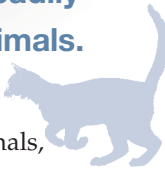
Physiotherapy (or physical therapy) is concerned with physical function, and considers the value of movement and the optimisation of physical potential as being core to the health and wellbeing of individuals. Although often perceived as an alternative therapy, physiotherapy is actually complementary and best used in conjunction with conventional veterinary treatment. The practice of physiotherapy involves a range of physical modalities used to treat and prevent injuries, restore movement and maximise physical function. For humans, the benefits of physiotherapeutic intervention have been well documented within the realms of health promotion, prevention, treatment and rehabilitation.^{1,2} Physiotherapists form an important part of the human health care team, using problem solving and clinical reasoning skills, supported by a sound evidence base, to provide high levels of clinical care to ensure optimum outcomes for patients following injury, surgery or disease.

In recent years, physiotherapy for animals has enjoyed an explosion of interest among the veterinary profession and the pet-owning public. While research into the benefits of physiotherapy for animals is still in its infancy, many techniques, treatments and rehabilitation regimens successfully

used on human patients have been readily adapted for use in animals, and some preliminary animal studies have shown good results.^{3–5}

In the UK, the practice of physiotherapy on animals is governed by the Veterinary Surgery (Exemptions) Order 1962, which permits the treatment of an animal by physiotherapy as long as that treatment is provided under the direction of a veterinary surgeon who has examined the animal and has prescribed the treatment of that animal by physiotherapy. It is the responsibility, therefore, of the veterinarian to ensure that physiotherapy is carried out by someone fully trained and qualified to do so. Recognised qualifications relating to the practice of physiotherapy on animals are not legally defined in most countries, so

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Part 2

Part 2 describes the clinical application of a variety of physiotherapy modalities in the rehabilitation of cats with various orthopaedic and neurological conditions. It also discusses considerations for recumbent and obese cats, those with compromised respiratory function and those in the intensive care unit.

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Brian J Sharp
MSc(VetPhys) BSc(Phys) BSc(Biol) PGCertEd
PGDipHealthEd MCSP HPCRReg MACPAT
The Queen Mother Hospital for Animals,
Royal Veterinary College,
Hawkshead Lane, North Mymms,
Hatfield, Hertfordshire AL9 7TA, UK
Email: caninephysio@yahoo.co.uk



The success of physiotherapy with cats demands a good understanding of feline behaviour, coupled with excellent handling skills.



many people have taken on the role of the 'physiotherapist', often with no formal qualifications in physiotherapy. Within small animal practice both the nurse and the veterinarian have often adopted the role as an adjunct to that for which they have been trained.

In the UK, an increasing number of veterinary practices now collaborate with qualified veterinary physiotherapists, and in most cases decisions regarding appropriate physiotherapeutic and rehabilitative care are best made through a team approach involving the veterinarian, physiotherapist and nurse, to allow different perspectives to be aired with the aim of achieving optimum outcomes for the patient.⁶ Veterinary expertise can establish diagnoses and determine appropriate medical or surgical interventions; physiotherapy expertise can identify associated mechanical dysfunctions and develop appropriate treatment plans for restoring physical function.⁷

What about cats?

Cat ownership is increasing in many countries, yet, despite this, our understanding and treatment of cats by physiotherapy has lagged behind that of dogs.⁸⁻¹⁰ With treatment advances and high costs involved in feline veterinary medicine and surgery, cat owners are beginning to expect similar postoperative and post-injury care for their pets as their dog-owning counterparts.

Although cats can benefit from the suitable application of effective physiotherapy techniques and appropriately planned and executed rehabilitation programmes, compliance with treatment is often less predictable than with dogs, and the success of therapy with cats demands a good understanding of feline behaviour, coupled with excellent handling skills.¹¹ As with dogs, compliance can often be enhanced through the provision of enticing rewards (eg, treats, attention, play opportunities).

Benefits of physiotherapy

Many conditions can benefit from physiotherapeutic intervention (see box). One major application of physiotherapy in animals is for postoperative management following orthopaedic or neurological surgery,¹² although it can also benefit other acute and chronic disorders in which surgery is not required (eg, muscle, tendon or ligament injuries and arthritis).

Postoperatively, physiotherapy helps to:

- ❖ Control inflammation, swelling and pain;
- ❖ Promote wound healing and ordered scar formation;
- ❖ Promote early weightbearing and prevent the development of compensatory gaits;
- ❖ Maintain/restore range of motion (ROM) and prevent the development of adhesions, fibrosis and contracture;
- ❖ Restore muscle properties (strength, endurance, speed of activation) and normalise tone following neurological insult;
- ❖ Restore balance and proprioception;
- ❖ Promote and restore normal movement patterns and function;
- ❖ Improve cardiovascular fitness;
- ❖ Prevent the development of hyperalgesia and chronic pain;
- ❖ Maintain bronchial hygiene, eliminate secretions from airways, re-expand atelectatic lung segments, improve oxygenation and reduce the incidence of pneumonia;
- ❖ Return the animal to optimal function.

Indications for physiotherapy and rehabilitation

Orthopaedic

- ❖ Postoperative rehabilitation – eg, following fracture treatment, joint surgery, luxation repair, arthrodesis, amputation, ligament/tendon repair
- ❖ Acute and chronic soft tissue injuries involving muscle, tendon, joint capsule or ligament (conservative care)
- ❖ Degenerative joint disease (long-term management)
- ❖ Hip dysplasia (conservative care)
- ❖ Trauma and wound care
- ❖ Lumbar, thoracic and cervical pain

Neurological

- ❖ Postoperative rehabilitation – eg, following spinal decompression surgery
- ❖ Intervertebral disc disease (conservative care)
- ❖ Central or peripheral nerve injuries – eg, brachial plexus avulsion
- ❖ Fibrocartilaginous embolism
- ❖ Balance/vestibular problems

Other

- ❖ Respiratory conditions – eg, bronchitis, atelectasis, pneumonia
- ❖ Care of recumbent/intensive care unit patients
- ❖ Pain management
- ❖ Obesity
- ❖ Depression
- ❖ Geriatric care

Although valuable postoperatively, physiotherapy can also have a useful role in preoperative rehabilitation.^{7,13} In this context it can be used to:

- ❖ Prepare the animal physically for the forthcoming surgery (improving muscle strength and joint stability, ROM, balance and proprioception);
- ❖ Familiarise the animal (and owner) with the exercises required following surgery;
- ❖ Provide the owner with a sense of involvement and a good feel for the commitment that is going to be required following surgery.

In some cases, the animal may improve to such a degree that surgery is no longer required.

Modalities used in physiotherapy

The techniques and modalities used in physiotherapy are numerous and varied. Physiotherapists select, prescribe and implement appropriate modalities when the examination findings, diagnosis and prognosis indicate the use of specific approaches. Often a combination of modalities is used, coupled with expert advice (to owners and fellow veterinary professionals), to maximise outcomes and return the patient more quickly to optimal function.

The primary techniques fall into three categories: manual therapy, electrophysical and thermal treatments, and therapeutic exercise. The benefits of these are discussed in turn in the following sections. Importantly, the performance of any of these techniques demands a thorough understanding of the respective indications, contraindications, physiological effects and practical application. It is outside the scope of this article to cover all these elements in detail, but further information regarding the use of these modalities with animals (together with their contraindications) is readily available in other texts.^{7,9,14,15}

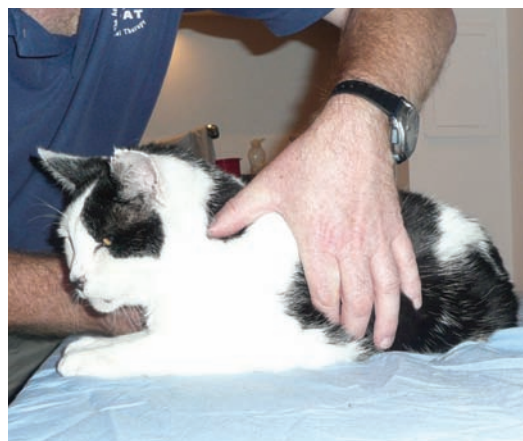


Figure 1 Mobilisations performed on the cervical spine for pain relief

Although valuable postoperatively, physiotherapy can also have a useful role in preoperative rehabilitation.



Manual therapy

There are many manual therapies that can be used on cats. To achieve the most beneficial effects they all demand a degree of calmness and cooperation on the part of the cat so that tissues are relaxed during treatment. Cats that are fearful or stressed are likely to benefit less from these techniques, although in many cases relaxation can be achieved as an effect of the technique itself. Some of the basic techniques (such as massage, passive movements, stretches and heat/cold therapy) can be readily learnt by veterinarians and veterinary nurses, following suitable CPD training, and incorporated into daily practice. Many other techniques, however, demand specialised physiotherapy training.

Joint mobilisations and manipulations

'Physiological' joint movements (such as shoulder flexion, extension, abduction, adduction, medial and lateral rotation) are routinely tested in respect of ROM, pain and laxity. Although essential for normal physiological movements to occur, the so-called 'accessory' movements (such as the spins, slides and glides that occur between joint surfaces) are rarely tested, yet can often be the cause of joint restriction and pain. Accessory movements are unique to each individual joint. Physiotherapists assess these movements and treat any identified dysfunctions to ensure pain-free movement is achieved. Treatment comprises the techniques of mobilisation and manipulation, which should only be performed by someone specifically trained and experienced in using them.

❖ **Mobilisations** are passive movements made to joints, and are used to reduce pain and improve ROM (Figure 1). They are performed mainly as oscillatory movements in either the physiological or accessory range of a joint.^{16–18} Mobilisations can be performed as low or high amplitude movements in the direction of the joint line or to achieve compression or distraction of the joint surfaces. Joints may be mobilised individually or synchronously as a group, as would occur with many traction techniques. Some techniques allow mobilisations to be performed alongside active movements of the joint.

❖ **Manipulations** are low amplitude, high velocity thrusts that are performed at the end of the joint range, and are likewise used to reduce pain and improve ROM.

Soft tissue techniques

A wide range of techniques are used to mobilise and restore extensibility to tissues, improve circulation, reduce swelling and pain, and provide sensory stimulation. These include massage, soft tissue release, acupressure, myofascial release, trigger pointing, passive movements, stretches, neural mobilisations, reciprocal innervation, and proprioceptive neuromuscular facilitation (PNF) techniques.

✦ **Massage** is the most commonly used technique and involves the therapeutic manipulation of soft tissues and muscle by stroking, kneading and/or percussion. The effects of massage are achieved via various mechanical, physiological and psychological means (see box). Different types of massage will achieve very different effects (Tables 1 and 2), and basic massage techniques can be easily learnt and used by veterinary staff and owners. Selection of appropriate techniques should be based on the individual requirements of the animal (ie, desired effect, size of animal and area requiring treatment, any pertinent contraindications, etc) (Figure 2). In humans, massage reduces stress and creates a relaxed state, as well as providing positive tactile stimulation. In animals, the effects are largely undocumented to date, but massage remains useful as a benign, non-invasive and inexpensive clinical intervention that is generally well tolerated by cats. Paradoxically, those cats that could

General effects of massage

Mechanical

- ✦ Mobilisation of skin and tissues
- ✦ Management of scar tissue
- ✦ Loosening of secretions

Physiological

- ✦ Drainage of venous blood and lymph
- ✦ Afferent input – sedative or stimulatory
- ✦ Pain control via
 - The 'pain gate'
 - Removal of noxious chemicals (circulatory effect)
 - Release of endorphins
- ✦ Effects on musculoskeletal system
 - Reduction of muscle fatigue and delayed onset muscle soreness (DOMS)

Psychological

- ✦ Reduced tension and anxiety
- ✦ Improved relaxation

benefit most from massage (the frightened and anxious ones) can find the physical contact involved threatening and intimidating.¹⁹ Nevertheless, in patients with restricted mobility, massage is an indispensable



Figure 2 (a) Stroking massage is used to calm and relax cats. (b) Kneading massage to the paravertebral muscles increases circulation and relaxes the muscles



Table 1 Description of various massage techniques

	Technique
Stroking	Hands glide smoothly over the body, maintaining contact with the skin. Starts proximally and ends distally when treating the limbs
Effleurage	Hands mould to the shape of the limb and maintain pressure throughout the movement. Starts distally and ends proximally, moving in the direction of venous and lymphatic drainage
Kneading	Tissues are squeezed, compressed and released in a rhythmical manner. Hands move in a circular motion
Picking-up (squeezing)	Muscles are grasped, lifted, squeezed and released
Wringing	Hands move in opposite directions across the long axis of the muscle, stretching the tissues
Skin rolling	Fingers and thumb lift the skin, and roll the tissues forwards or backwards
Frictions	Fingers or thumb move superficial tissues over deeper ones, with increasing pressure
Hacking	The ulnar border of the little finger strikes the area being treated. Hands work alternately (pronation and supination) and fingers are kept relaxed
Coupage (clapping)	Hands are cupped and wrists are loosely flexed and extended. Hands work alternately and firmly strike the treatment area
Shaking	One hand holds the muscle, and vigorously shakes it
Vibrations	Hands hold around the area of chest being treated and lightly shake the chest. Vibrations are performed during the exhalation phase of breathing and the hands gradually move cranially

alternative to active exercise, maintaining soft tissue pliability, circulation and sensory stimulation.

❖ **Passive movements** are movements of a joint made in a rhythmical manner through the full pain-free range (Figure 3). Although primarily used to maintain or restore joint range/muscle length, they also aid articular nutrition, stimulate mechanoreceptors and reinforce patterns of movement.²⁰ These techniques are completely passive and require no active involvement of the animal, so will not prevent muscle atrophy or increase strength. They are generally used to maintain range postoperatively when an animal is incapable of moving the joint on its own (following neurological insult or injury) or when active motion may be deleterious to the patient. Gait patterning is a form of passive movement whereby a limb is moved in a normal walking (bicycling) motion, and is particularly useful for neurological patients (see Part 2).

❖ **Stretches** are also passive movements that help to improve or restore full range to a joint or full length to a muscle (Figure 4). Whereas passive movements create elastic (temporary) deformation of tissue and maintain normal length/range, stretches create plastic (permanent) deformation and an increased length/range. Long-term effects of stretching include adding sarcomeres to muscle mass. Stretching is generally more effective if preceded by light exercise, massage, heat or



Figure 3 Passive movements – in this case, to the left shoulder joint into extension. These are gentle, safe movements that just touch onto initial resistance or point of discomfort

Figure 4 Stretch being applied to the hip flexor muscles



Table 2 Benefits of various massage techniques		
	Major benefits	Other benefits
Stroking	Accustoms cat to touch Reduces tension and anxiety Lowers muscle tone	Useful for starting and finishing massage session Provides a helpful link between different techniques
Effleurage	Reduces swelling and oedema	Removes chemical by-products of inflammation Maintains mobility of soft tissues Stretches muscle
Kneading Picking-up Wringing	Increase circulation and lymphatic flow Mobilise soft tissues	Remove chemical by-products of inflammation Provide sensory stimulation and invigoration (fast technique) Relaxation and lowering of muscle tension (slow technique)
Skin rolling	Mobilises skin and scar tissue	
Frictions	Break down adhesions	Local hyperaemia
Hacking Coupage (clapping)	Increase circulation Sensory stimulation Loosen chest secretions and stimulate coughing (coupage)	
Shaking	Increases circulation Mobilises soft tissues	Provides sensory stimulation Reduces adhesions
Vibrations	Loosen chest secretions and stimulate coughing	

therapeutic ultrasound, all of which increase the extensibility of collagen.

– *Static stretching* utilises a low force that is held for a minimum of 30 s (and repeated several times). This is a comfortable stretch which should not cause tissue damage, and which allows realignment of collagen fibres. A total treatment time of 20–30 mins daily has been identified as the optimum to achieve improvement.^{21,22}

– *Prolonged mechanical stretching* also utilises a low intensity stretch with the aid of casts or splints (often used serially). This can be continued for longer periods of time (from 20 mins to several hours daily).

❖ **Neural mobilisations** require detailed knowledge of the course of nerves, and gentle and precise handling of the limbs to effect mobilisation of the required nerve.²³ Being mobile structures, nerves travel through various interfaces, and neural mobility can become compromised through injury, surgery and muscle spasm, which can result in pain (localised or referred), paraesthesia and a variety of other sensory aberrations. The successful restoration of adequate neural mobility has been reported in people using a combination of joint mobilisations, soft tissue treatment and neural mobilisation techniques.

Electrophysical and thermal treatments

Many electrophysical agents can be used on animal patients, including laser, ultrasound, neuromuscular electrical stimulation (NMES) and transcutaneous electrical nerve stimulation (TENS). These are all non-painful forms of treatment and cats are generally tolerant of their use. However, all these modalities possess inherent dangers and should only be used by operators who have received specialised training. By contrast, the basic techniques of applying heat (thermotherapy) and cold (cryotherapy) can be readily learned and incorporated into daily practice by veterinary staff.

Laser therapy

The laser is a form of light amplifier, enhancing particular properties of light energy. Many different types of laser are available, but for therapeutic purposes class 3A or 3B lasers are used with typical wavelengths of 600–1000 nm. The treatment device may be a single emitter (or probe) or a cluster of several emitters (cluster probe) with a combination of lasers and light-emitting diodes (Figure 5). Much of the laser light energy is absorbed in the superficial tissues, and penetration is rarely greater than a few millimetres. However, it is believed that deeper effects can be achieved as a secondary consequence via a chemical mediator system whereby the cell membrane acts as the primary absorber of the energy, and then generates intracellular effects by means of a cascade-type response.²⁴ It has been reported in horses that penetration can be improved following clipping and cleaning of the area.²⁵

Laser application is predominantly used for its effects on wound healing, inflammatory arthropathies and soft tissue injury, and for the relief of pain. There is a growing body of evidence supporting the clinical use of laser therapy in humans,^{26–28} but, as with many treatment modalities, evidence of its value with animals remains limited at the present time.

Therapeutic ultrasound

Ultrasound produces mechanical vibrations that are the same as sound waves but at higher frequencies, beyond the range of human hearing (Figure 6). In therapy the frequencies used are typically between 1.0 and 3.0 MHz. Deeper treatments (4 cm aver-

There is published evidence to show that low intensity pulsed ultrasound accelerates fracture healing.



age) benefit most from a 1 MHz frequency whereas 3 MHz is used for more superficial treatment (2 cm average), although actual levels of penetration depend on the type of tissue being treated. As the ultrasound waves pass through the body tissues, energy is absorbed, particularly by tissues with a high collagen content such as ligament, tendon, fascia, joint capsule and scar tissue.^{29,30} Animal hair absorbs much of the transmitted energy so clipping and use of a coupling medium is always required.³¹ Coupling can be achieved in various ways to suit the requirements of the individual animal: direct contact using ultrasound gel; water bag application using a plastic or rubber bag filled with warm water together with ultrasound gel; and water immersion, whereby the part is treated under water and water acts as the couplant.³²

Ultrasound can be used to produce thermal, as well as non-thermal, effects to the body tissues. Pulsed or continuous modes are available, with pulsed modes used for healing purposes and continuous modes used for thermal effects.³² If used for its thermal effects, ultrasound should not be used over metallic surfaces, as this may intensify and prolong the heating effects.

Application of ultrasound during the inflammatory, proliferative and repair phases of tissue healing is of value because it stimulates or enhances the normal sequence of events and thus increases the efficiency of the repair process. It can influence the remodelling of scar tissue by enhancing the appropriate orientation of the newly formed collagen fibres and also triggering a collagen profile change from mainly type III to a more dominant type I construction, thus increasing tensile strength and enhancing scar mobility.³³

There is published evidence to show that low intensity pulsed ultrasound accelerates fracture healing,^{34–36} and can benefit many bone-related disorders, including normally healing fractures, stress fractures, and delayed and non-unions. Several of these studies have been performed on animals.^{37–39}

Figure 5 Laser therapy is predominantly used for pain relief and to improve wound healing. The cluster probe pictured contains a combination of lasers and light-emitting diodes



Figure 6 Therapeutic ultrasound can be applied using different size treatment heads. Coupling mediums can include ultrasound gel (pictured), water or a water-filled coupling cushion (plastic or rubber bag)

Neuromuscular electrical stimulation

The technique of NMES stimulates the motor nerves and evidence exists for its 'strengthening' effect and for its ability to prevent disuse muscle atrophy.⁴⁰ This is particularly useful for animals that cannot generate useful voluntary contraction on demand, and for those that find active exercise difficult.^{41,42} There is no evidence that NMES provides any significant benefit over active exercise, and the treatment is generally stopped once the animal is able to exercise actively. This modality can also be useful for muscle re-education and facilitation of muscle control, improving sensory awareness, decreasing spasticity and muscle spasm, and reducing oedema. In a normal muscle contraction, type I (slow twitch) postural muscle fibres tend to be recruited first, followed by type II (fast twitch) fibres. With NMES this is reversed, and so it preferentially prevents atrophy of type II fibres.^{43–45}

To date there have been no studies determining optimal parameters for NMES in cats, though best practice guidelines have been produced in the medical field.⁴⁶ The use of NMES requires clipping of fur, cleaning of skin and the use of conductivity gel to maximise contact between the electrodes and the skin.

Transcutaneous electrical nerve stimulation

TENS provides symptomatic pain relief by specifically exciting sensory nerves and thereby stimulating the 'pain gate' mechanism and/or the endogenous opioid system. Pain relief by means of the pain gate mechanism involves activation (excitation) of the A β sensory fibres, and subsequent reduction of noxious stimuli transmission from the 'c' pain fibres. The A β fibres respond most effectively to a relatively high rate of stimulation (90–130 Hz). The alternative approach is to stimulate the A δ fibres, which respond preferentially to a much lower rate of stimulation (2–5 Hz). This provides pain relief by causing the release of an endogenous opiate (enkephalin) in the spinal cord, which in turn reduces the activation of the noxious sensory pathways.⁴⁷

As with NMES, the use of TENS requires clipping of fur, cleaning of skin and the use of gel. TENS electrodes can variously be located around the painful site, at the relevant nerve root, along the peripheral nerve supplying the painful area, and over trigger/acupuncture points.⁴⁸



Figure 7 Cold compression units are generally regarded as more effective than most other forms of cold therapy as they combine cold with compression. The sleeve is fitted snugly around the cat's limb and filled with ice-cold water from the container. The hose can be disconnected after filling, and reconnected after treatment to empty the sleeve

Heat and cold therapy

Heat can be applied superficially (1–2 cm) via hot packs, baths/spas and hosing, or more deeply (4 cm or more) using therapeutic ultrasound. In small animal practice, superficial heating is most commonly used. This is particularly useful for subacute and chronic conditions where there is a reduced ROM due to stiffness or contracture; to relieve pain; and as a prelude to passive movements, stretches or exercise by improving collagen extensibility. Hot packs should be used at a comfortable temperature, wrapped in towelling to avoid burns and should be applied for 10–20 mins.

Cold penetrates deeper and lasts longer than heat and is most effective when used in the first few days after trauma (accidental or surgical). During this acute phase of inflammation it provides analgesia, reduces inflammation and swelling, controls bleeding and reduces muscle spasm. Cold can be applied using cold packs and cold compression units (Figure 7), and treatment should be limited to 10–15 min sessions. This can be repeated every 2 h if necessary (for severe injuries), but for most postoperative/injury applications it is suggested that cold therapy is given every 3–4 h. Superficial tissues show the most rapid cooling and rewarming effects; the deeper intramuscular tissues respond more slowly and may take as long as 60 mins to return to baseline temperature after a 10 min application of a cold pack.⁴⁹

The basic techniques of applying heat and cold can be readily learned and incorporated into daily practice by veterinary staff.

Forms of therapeutic exercise

Strengthening

Strength is the ability of a muscle or muscle group to produce tension and a resulting force. Exercises to improve strength create an increase in the myofibril component of the muscle, thereby increasing the cross-sectional area of the muscle. Strengthening exercises include such activities as running, slope work (uphill and downhill), use of leg or body weights, dancing, wheelbarrowing and swimming.

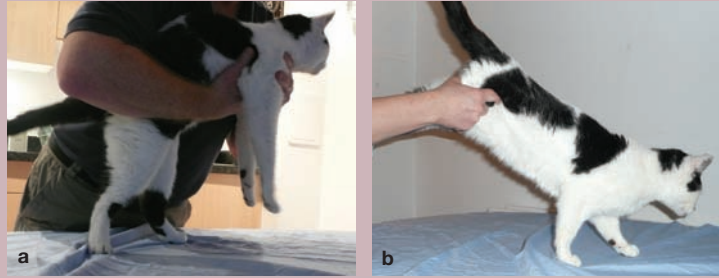


Figure 8 Strengthening exercises such as dancing (a) and wheelbarrowing (b) allow limbs to be exercised against the cat's bodyweight

Flexibility

Flexibility describes the capacity of the muscles, tendons and ligaments to stretch, allowing the joints to have a larger ROM, and the cat to be able to manoeuvre through awkward spaces. Flexibility is important for cats as it also helps to protect against injury. Flexibility exercises include activities that make the cat reach or stretch for something, or encourage crawling under, through or over obstacles.

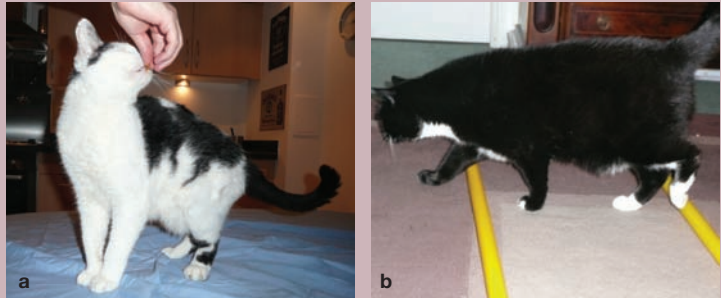


Figure 9 Flexibility exercises such as baiting (a) and step-overs (b) help restore or improve ROM to joints. Baiting primarily exercises the spinal joints, and assists balance retraining; step-overs also assist with balance and gait re-education

Balance and proprioception

Balance is the ability to adjust equilibrium at a stance (static balance) or during locomotion (dynamic balance) to take account of changes in direction or ground surfaces. Proprioception is the unconscious perception of movement and spatial orientation originating from the body. It is the body's way of knowing where all its different parts are and what they are doing. Proprioception diminishes with age, and is also affected by injury or surgery, especially following neurological damage.

All cats need good balance and proprioception to function normally. Balance exercises include activities requiring rapid responses to changes in supporting surface (eg, wobble cushion, balance pad, trampoline) and changes of direction when moving, as well as playing with toys, dancing and standing on a gym ball. Proprioception exercises include weight shifting, walking in circles or weaving, walking over obstacles of various shapes, height and spacing, and walking over different terrains.

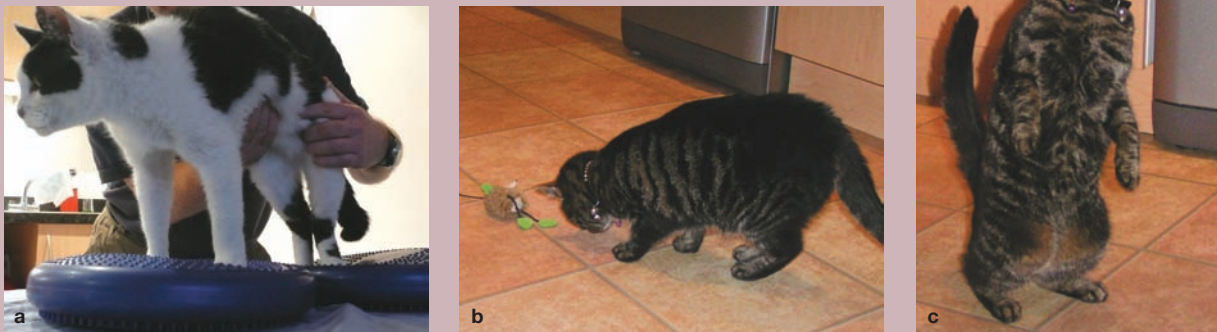


Figure 10 Balance is especially important for cats, and exercises to improve static balance include the use of unsteady surfaces such as bean bags, trampolines or wobble cushions (a). Playing with toys (b) provides dynamic balance training, while treats (c) can be used to offer particular challenges

Endurance

Endurance allows animals to perform activities for prolonged periods of time without tiring. Exercises to improve aerobic endurance usually target muscle groups for periods exceeding 15 mins, and are repeated several times each week. Long-term changes occur in muscle, including increased vascularisation, alongside decreased resting heart rate and increased stroke volume (allowing greater time for ventricular filling), decreased resting blood pressure and increased respiratory enzymes. Endurance exercises are less relevant to cats, which rely more on stealth and rapid movements to catch prey.

Therapeutic exercise

Exercise represents the final element in the process of helping an animal achieve optimum function following injury, surgery or disease and is used to:

- ❖ Prevent long-term physical impairment;
- ❖ Enhance function;
- ❖ Reduce the risk of injury and re-injury;
- ❖ Optimise overall health;
- ❖ Enhance fitness and wellbeing.

Types of exercise

Exercise can be divided into four principal types (see box on page 629):

- ❖ Strengthening (Figure 8);
- ❖ Flexibility (suppleness) (Figure 9);
- ❖ Balance and proprioception (Figure 10);
- ❖ Endurance (stamina).

All therapeutic exercise programmes should be tailored to the animal and comprise a combination of the four types, dependent on the individual's needs.

Land-based exercise

Land-based exercises should form the major component of exercise programmes designed for cats because, being land animals, they must obviously be able to cope with life on land. In many cases cats may be more accepting of exercises that involve less manual contact from the therapist (or owner) – see Part 2 for examples.

Water-based exercise

Hydrotherapy is one of the most useful forms of rehabilitation therapy, and has become a very popular modality for dogs to help in the recovery of musculoskeletal and neurological conditions. Water provides an ideal environment for performing non-concussive active exercise, and through its natural properties (buoyancy and resistance) can help improve limb mobility, strength and joint ROM.⁵⁰

In practice, hydrotherapy is performed less often with cats, but it should not be automatically dismissed as an option as it is certainly achievable in some cases (Figure 11). There are several forms of hydrotherapy, including pools and water treadmills. The therapist should accompany the cat into the water to provide assistance and reassurance until it is accustomed to the activity (Figure 12).⁵¹ In the author's experience a cat may be more accepting of water if it is initially introduced to it in the home environment (bath or sink), as a gradual progression from being bathed to being rehabilitated is often more acceptable

Benefits

Therapeutic exercise may be used to improve:

- ❖ Aerobic capacity and endurance
- ❖ Agility, coordination and balance (static and dynamic)
- ❖ Gait and locomotion
- ❖ Neuromuscular capability and movement patterning
- ❖ Postural stabilisation
- ❖ Range of motion
- ❖ Strength and power

(Figure 13). Additionally, the presence of the owner can often provide confidence and reassurance to nervous cats. At no time should any animal be left unattended during a hydrotherapy session, because water aspiration and drowning are real risks.

Postoperatively, hydrotherapy may be employed as soon as the surgical incision has established a fibrin seal (generally 48–72 h post-surgery), although in practice most hydrotherapy with dogs is started 2–3 weeks following surgery.^{4,5}



Hydrotherapy should not be automatically dismissed as an option, as it is certainly achievable with some cats.



Figure 11 Hydrotherapy can be successfully carried out with cats, whether in a pool or a water treadmill. Too weak to support itself on land, this cat is able to mobilise normally in the treadmill due to the buoyancy provided by the water. Courtesy of Simon Jacobs



Figure 12 Comfort and reassurance can be very beneficial when introducing cats into water. Courtesy of Sam Jacobs



Figure 13 Accustoming a cat to the normal processes of bathing and drying can aid eventual introduction to more formal hydrotherapy sessions. Courtesy of Sam Jacobs

Exercise considerations

The design of an appropriate exercise programme must take account of the current physical abilities of the cat, stage of recovery/healing and the desired outcome. If assistance is required for the animal to perform an exercise, this can be provided manually or with the aid of 'physio-rolls', slings, harnesses or carts (Figure 14). Exercises must meet the specific needs of the individual animal, with progression applied to the programme (increasing the difficulty of the exercise as the animal achieves each stage), as appropriate.

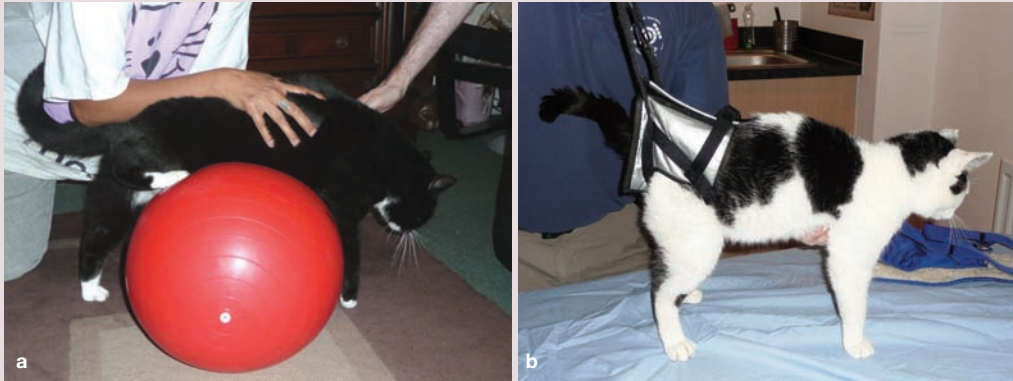


Figure 14 The use of a physio-roll (a) and harness (b) provides sufficient support to allow the cat to perform exercises and activities it would otherwise be unable to do

Conclusion

The recent surge of interest in physiotherapy and rehabilitation within small animal practice has provided the veterinarian with many challenges and among these is the potential to provide therapy to cats. A belief that cats will not cooperate with therapy is restricting its use and, although evidence of the value of physiotherapy and rehabilitation for cats is limited at present, there is an increasing evidence base in the canine field, and a sound evidence base for the use of these modalities in humans. There seems no moral justification, therefore, in withholding these therapies for cats in the absence of species-specific clinical trials.

To treat cats effectively and safely requires a good knowledge and skill base in physiotherapy and rehabilitation techniques, coupled with a good understanding of feline behaviour.

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Conflict of interest

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