The contribution of physiotherapy to the management of osteoarthritis

People with osteoarthritis are frequently referred for physiotherapy to improve pain and function. All health-care interventions must be safe, effective, acceptable, deliverable and affordable. This article summarizes some of the evidence evaluating whether physiotherapy achieves these aims.

Physiotherapy is an important component of management for people with osteoarthritis (Jordan et al, 2003). Using a holistic, biopsychosocial approach physiotherapy delivers a complex package of health care that combines various modalities, advice, information and education to improve pain and function and enable people to cope better with chronic ill-health. For a health-care intervention to be clinically useful it must be safe, effective and acceptable for patients, deliverable by clinicians, and affordable for health-care providers. This article reviews whether physiotherapy for osteoarthritis meets these criteria.

Rationale for physiotherapy interventions

Pain relief

The best conceptual physiological mechanism for pain relief for some physiotherapy modalities is the pain gate theory. This hypothesizes that impulses elicited by thermal (heating or cooling), mechanical (rubbing) or electrical stimulation of large diameter sensory nerves arrive in the spinal cord before smaller diameter neurons from nociceptors, blocking out the competing nociceptive input and thereby closing the pain gate. Other modalities may release endogenous opioids – endorphins and encephalins.

Alternatively, physiotherapy interventions may affect pain relief by normalization of altered biomechanics. The musculoskeletal system is extremely important in attenuating harmful forces our bodies experience daily. The pathological processes of osteoarthritis impair neuro-musculoskeletal protective mechanisms that expose people to rapid loading which is harmful and painful. Interventions that improve muscle functioning and skeletal realignment restore the body's shock absorptive capacity and redistribute excessive forces, relieving pain.

Improved functioning

It is assumed that relieving pain will lead to spontaneous improvement in functioning. However, people with chronic joint pain associate activity with pain, which people assume signals damage, and rest with pain relief. They surmise that refraining from activity will limit pain and damage and prolong the life of their joints. If people continue to refrain from activities they believe cause joint pain and damage then pain relief may not lead to spontaneous improvement in functioning.

The importance of muscle function for joint health

In fact fear-avoidance behaviours and inactivity causes muscle sensorimotor dysfunction – decreased strength, endurance, reaction time, proprioceptive acuity, fine motor control – which results in clumsy movement and gait, articular damage, pain and disability (Hurley, 1999). Maintaining well-conditioned muscles is vital for maintaining healthy, functional joints; of all the articular tissues affected by arthritis, muscle is the easiest to alter through exercise. Improving muscle function with exercise may delay or ameliorate the effects of osteoarthritis.

Specific interventions

Exercise

Exercise and physical activity can improve muscle sensorimotor function, shock absorption, decrease pain and disability and protect against further joint damage without serious side-effects (Fransen et al, 2002) (*Table 1*). In addition there are many other general health and psychosocial benefits, such as improved independence, self-confidence, self-esteem and social interaction (Hurley et al, 2003). Consequently, management guidelines strongly endorse exercise-based rehabilitation (Jordan et al, 2003). However, these have tended to be prolonged and complicated regimens that require supervised use of sophisticated equipment. Once supervised rehabilitation ceases, people's motivation to exercise wanes and the benefits are lost. To sustain benefits, patients must continue to participate in regular exercise. Given the size of the population, the chronic nature of the condition and limited resources, the clinical applicability of many exercise regimens is limited. Clinically practicable regimens have been developed that are more likely to be deliverable to large

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numbers of people (Ettinger et al, 1997; Thomas et al, 2002; McCarthy et al, 2004; Hay et al, 2006; Hurley et al, 2007a).

Acquiring and retaining health benefits from exercise requires effort, will power and determination, but does not require long bouts of exhausting, complicated, supervised formal exercise regimens, joining a gym or use of expensive equipment. Most routine activities, e.g. walking, a day out, gardening, shopping and housework, are informal exercise with health benefits. To obtain health benefits physical activities must be performed for 30 minutes most days of the week, this can be accumulated throughout the day, e.g. one 30-minute or three 10-minute brisk walks, but the benefits from physical activity are dose-related so the more exercise taken the better. The key to sustaining benefits is to find an activity a person enjoys, whether it is formal exercise, activities such as yoga and T'ai Chi, or informal exercise or physical activity.

Patient education, coping and self-management

Participation in supervised exercise or physical activity challenges inappropriate health beliefs that movement is bad for joints and causes pain. These and other widely held fallacies about osteoarthritis are also challenged in patient education and self-management programmes advising about simple pain coping strategies, the importance of maintaining correct body weight, joint protection, the benefits of regular exercise or physical activity, and ways to overcome barriers to exercise and rest-activity cycling so that people can cope with and self manage their problems (Superuio-Cabuslay et al, 1996; Newman et al, 2004). This information and advice is a vital component of physiotherapy as it is subtly used to help people to appreciate the benefits of simple exercise regimen. Rehabilitation programmes that combine exercise with patient education, self management and coping strategies maximize the benefits from both physical and educational approaches, improve long-term adherence with activity and the overall management of these patients (Hurley et al, 2007a).

Table 1. Short and long-term effectiveness, cost-effectiveness and clinical practicability of physiotherapy modalities used in the management of osteoarthritis

Modality		Short-term effectiveness	Cost effectiveness	Practicable	Long-term effectiveness
Exercise	Land	✓	✓	✓	?×
	Water	✓	?×	?×	?
Self-management		✓	✓	✓	?✓
Heat or cold		✓	?✓	?✓	?✓
TENS		✓	?✓	?✓	?✓
Orthoses or sticks		?✓	?×	?✓	?×
Massage		?	?✓	✓	?
Acupuncture		?	?×	?	?
Electrotherapy		?	?×	?	?
Manipulation or mobilization		?	?×	?	?

✓ Good evidence from good quality randomized controlled trials in systematic or Cochrane reviews; ? Unclear because of lack of quality trials; ?✓ No evidence, but plausible; ?× No evidence, but unlikely. TENS = transcutaneous electrical neuromuscular stimulation.

Balneotherapy

Exercising in water is one of the oldest treatments for rheumatic conditions. It uses warm water's hydrodynamic properties to assist and resist movement, to relieve pain, muscle spasm, induce muscle relaxation and unload the lower limbs, promoting more effective exercise (Verhagen et al, 1997).

Spa therapy involves a 2–3-week stay at a spa resort, where people exercise in naturally heated water with a high mineral content, have hot mud packs applied and review their medication, diet and lifestyle. Its effectiveness is probably partially a result of the holistic respite care, relaxing environment and removing people from domestic pressures. Understandably popular with patients, it is expensive so much less popular with healthcare providers.

Hydrotherapy – exercise in a heated NHS-funded pool – is very popular but the need for dedicated expensive-to-maintain facilities and trained staff make it very expensive. As a result of high demand and limited resources, treatments are normally one-off bouts of brief treatment. Increasingly aquarobic classes are offered at public pools giving people the opportunity to continue benefiting from water-based exercises under the supervision of trained therapists. However, these pools are slightly cooler than NHS pools, and people seem less motivated to continue.

Thermotherapy

The application of cold and heat has also been used to relieve pain for millennia, and people frequently instigate use of hot water bottles, hot or cold packs, or warm clothing themselves. Besides acting through the pain gate, heat or cold may reduce pain and improve movement by improving circulation or reducing muscle spasm, peripheral nerve excitability, effusions and oedema. Thermotherapy has been found to be a safe, effective and cost-effective way to relieve pain, it is well liked by patients and an appropriate tool for self-management (Brosseau et al, 2003).

Manual therapy

Massage and the innate reaction to rub a hurting body part can relieve pain. Application of topical pharmacological agents, such as non-steroidal anti-inflammatory drugs (NSAIDs), or commercial creams, such as Deep Heat, may use and enhance the benefits of massage.

While massage has not been shown to be effective (Furlan et al, 2002), its intuitive reaction, subjective benefit, absence of side effects and ease of application mean massage will continue to be used by patients and therapists.

Manipulations consist of forceful, high velocity thrusts by a therapist. These are very popular with patients. There is some evidence they can affect short-term pain relief in chronic low back pain, but the size of the patient population on whom they can be administered safely is relatively small. Ill-considered manipulations performed by untrained practitioners, particularly in the cervical area, can be dangerous and potentially fatal (Hurwitz et al, 1996).

Mobilization consists of less aggressive joint movement and is used more often than manipulation in peripheral joints. There has been little evaluation of its efficacy for relieving pain, improving range of movement or function, the studies that have been performed suggest it has little efficacy (Hurwitz et al, 1996).

Electrotherapy

Diathermy, pulsed electromagnetic fields, ultrasound, low-level laser therapy and transcutaneous electrical neuromuscular stimulation (TENS) are often used by physiotherapists. Laboratory-based studies suggest physiological rationale for therapeutic effects, but systematic reviews (Gam and Johannsen, 1995; van der Windt et al, 1999) suggest little, if any, clinical benefit. The exception is TENS where high frequency, strong burst TENS for more than 4 weeks can reduce osteoarthritis knee pain (Osiri et al, 2000), moreover it is very safe, and can be self applied.

Acupuncture

Acupuncture is another popular intervention that has gained more acceptance and about 50% of all acupuncture treatments are for osteoarthritis. Scepticism about acupuncture arises from limited understanding and its use for pain relief remains contentious; it is thought to exert its effect through the production of opioid derivatives, including endorphins, or more controversially normalization of bioelectro-magnetic flow in meridians or energy channels. Individual trials report benefits of acupuncture in knee osteoarthritis, but a systematic review of acupuncture for osteoarthritis (Ezzo et al, 2001) reports conflicting results. The review highlights that better designed studies are less likely to support the efficacy of acupuncture.

Using the placebo effect

One important consideration is the powerful placebo effects that acupuncture, manual and electrotherapy modalities have, in addition people like high-tech interventions and physiotherapy. While seemingly trivial these facets may have some use when interacting with people and convincing them of the benefits of burdensome lifestyle changes – weight control, physical activity – that are less popular but more effective. They can be used as the sugar coating that sells the more effective but less digestible pill.

Walking aids and orthoses

Lateral heel wedges, neoprene sleeves, valgus braces and patellar taping are used to relieve pain and promote better function by attenuating and re-distributing excessive forces and improved proprioceptive input. Often efficacy is shown in small, preliminary proof-of-concept studies, but larger better designed studies often fail to confirm clinical effectiveness in a variety of these interventions. However, aids and devices can be unpopular with patients and compliance poor (Rogers and Holm, 1992). People believe walking sticks make them appear old, infirm and as though they are giving in to the condition, moreover they limit upper limb function and are unsuitable for patients with weak or painful upper limbs. Patellar taping, neoprene sleeves and mechanical braces can be difficult for elderly people to put on, uncomfortable, hot and cumbersome to wear, aesthetically unattractive, and often re-distribute the load, stress and pain elsewhere. Often off-the-shelf orthotics can cause problems as they are not right for every individual; custom-made devices would be better but are expensive.

Costs

Most physiotherapy research studies have not measured the costs incurred. Given that the patient population is large and the condition chronic, prolonged interventions that require a therapist (i.e. manual therapy, electrotherapy, balneotherapy, acupuncture) are not attractive options to health-care providers. Interventions of proven efficacy that encourage self-management (i.e. exercise, patient education or self-management, thermotherapy) and cost-effective (Lorig et al, 1999; Mazzuca et al, 1999; Thomas et al, 2005; Coupe et al, 2006; Richardson et al, 2006; Hurley et al, 2007b) are much more attractive options.

Conclusions

Physiotherapy is considered essential in the management of osteoarthritis. Some physiotherapy modalities (e.g. TENS, thermotherapy) may be efficacious, others (e.g. ultrasound, acupuncture, manual therapy) seem to be less so. Interventions that require continued input from a therapist, given the size of the chronic problem, are unmanageable with finite resources. Exercise and self-management have good short-term effects and are cost effective, and consequently form the cornerstone of physiotherapy management. Unfortunately maintaining burdensome lifestyle changes (regular physical activity, healthy diet and weight control) is difficult and less effective long term. Interventions that combine exercise and self-manage-

ment may have long-term benefits, but better ways of supporting the large numbers of people suffering osteoarthritis may need to be developed.

Many physiotherapy interventions have powerful placebo effects and are popular with patients, facets that therapists can use when getting people to comply with more burdensome interventions that require considerable time and effort (weight loss, exercise). **BJHM**

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KEY POINTS

- A health-care intervention must be safe, effective and acceptable to patients, deliverable by clinicians and affordable by health-care providers.
- In the management of osteoarthritis physiotherapy uses a holistic, biopsychosocial approach delivering a complex package of health care to improve pain and function and enable people to cope better.
- Evidence-based clinical guidelines recommend early use of some physiotherapy modalities because physiotherapy is very safe.
- There is good evidence that exercise and self-management relieve pain, improve functioning, are cost-effective and encourage self-reliance, but require time and effort, there is some evidence supporting the use of transcutaneous electrical neuromuscular stimulation, hot/cold packs and massage, and there is little evidence supporting use of electrotherapy, acupuncture and manual therapy.
- Physiotherapy's popularity and powerful placebo effects can be used to deliver a package of health care that may contain less popular burdensome components.