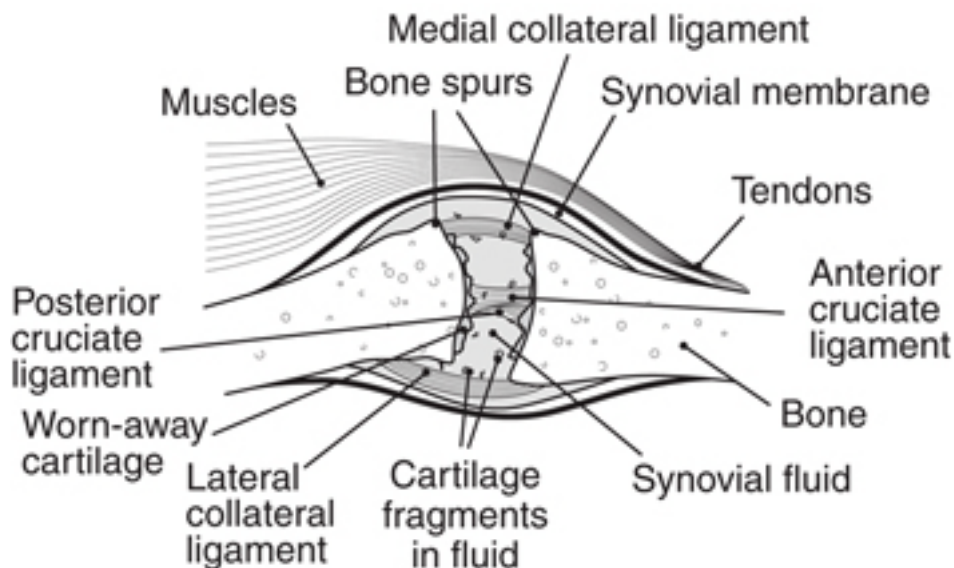


The use of exercise and its effect on osteoarthritic pain – a brief summary of the evidence

Background

Osteoarthritis is a common condition which is metabolically active and dynamic: it is notable for the progressive loss and degeneration of articular cartilage, the formation of osteophytes reducing joint movement, and sclerosis of the subchondral bone¹⁻³. Estimates suggest that up to 8.5 million people in the UK are affected by joint pain that may be attributed to osteoarthritis⁴. Clinical features include pain, bony tenderness and crepitus and are frequently accompanied by swelling and instability of the joint. The combined features commonly result in disability⁵.

Osteoarthritis can affect many joint sites, either singly or in combination; in single joint sites (most commonly in the knee, hip and hand) it demonstrates a consistent age-related increase in prevalence⁶. The most common site of peripheral joint pain lasting for more than one week in the past month is the knee joint in 19% of adults over the age of 45; the highest prevalence of knee pain (35%) is in women aged 75 and over⁷. In adults aged 50 years and over, 23% report severe knee pain and disability⁸. When considering hand symptoms, one month period prevalence ranges from 12% in adults aged 45 years and over to 30% in adults aged 50 years and over^{7,9}.



Osteoarthritic knee joint

Image supplied by the National Institute of Arthritis, Musculoskeletal and Skin Diseases. www.niam.nih.gov.

Radiographic changes are not commonly associated with levels of disability¹⁰, or the clinical progression of symptoms¹¹. The prevalence of radiographic arthritis is higher

in women than in men, especially over the age of 50 in cases of hand and knee arthritis. Radiographic changes are present in 25% of communities with knee osteoarthritis¹². Ethnic differences in radiographic arthritis have been hard to distinguish although recent reports comparing Chinese and US populations have demonstrated much lower levels of hip osteoarthritis in the Chinese, although levels of hand and knee osteoarthritis were generally similar¹³.

Physiological summary of what occurs

A number of studies have been conducted to try and identify biochemical changes as a result of OA changes and to discriminate between early and end-stage disease to act as parameters to measure disease severity. Honsawek *et al* identified that plasma levels of bone morphogenic protein-7 significantly correlated with disease severity¹⁴. In further studies they found that osteopontin in both plasma and synovial fluid is related to progressive OA joint damage¹⁵.

Risk factors for arthritis

The numerous risk factors for osteoarthritis reflect the fact that it is not a single condition but a common complex disorder. The risk factors are broadly divisible into:

- Genetic factors – the responsible genes have not been identified, but heritability estimates for hand, knee and hip osteoarthritis are high at 40-60%.
- Constitutional factors – these can include ageing, the female sex, obesity, and high bone density
- Biomechanical factors – these tend to be more local and include joint injury, occupational or recreational usage, reduced muscle strength, joint laxity, and joint malalignment

In the latter two categories, it should be considered that many of the environmental or lifestyle risk factors are reversible. This can be said of obesity or muscle weakness, and occupational or recreational joint trauma. The importance of individual risk will vary, as will their effects on joint sites. The risk factors that affect the development of osteoarthritis may vary to those affecting its progression and outcomes¹⁶.

Current guidelines consider a variety of different interventions that exist to assist in the management of osteoarthritis. They consider exercise, manual therapy, weight loss, and pharmacological management. In this article the role of exercise will be considered.

Exercise.

Exercise is commonly used and recommended by health professionals to reduce pain and improve function^{17,18}. Any exercise programme should be targeted at the joints affected by the OA, and aim to improve general mobility, function, well-being and self-efficacy. More intensive exercise can strengthen muscles around the affected

joints. The mistaken belief that exercise contributes to “wearing out of the joints” prevents many people from exercising in any form; in a similar vein the fear that symptoms will be exacerbated often puts people off exercise. Hurley *et al*, 2007 found that although some patients may experience a temporary exacerbation, the vast majority of patients, irrespective of the severity of their symptoms will not experience any adverse reaction¹⁹.

The 2008 guidelines developed by the National Institute for Health and Clinical Excellence (NICE) considered the evidence for a range of different types of exercise interventions¹⁶. In view of the large number of studies in this area, only studies involving randomised controlled trials were included in the evidence review. Exercise involving land-based exercises was examined: 13 randomised controlled trials (RCTs) were identified using aerobic and strengthening exercises for the knee joint alone. A summary of the findings of the trials and their outcome in attempting to reduce pain is included within Table 1. The NICE review was one of many pieces of evidence considered by Williams *et al*, 2010 to develop a booklet for the active management of hip and knee osteoarthritis²⁰.

Adverse reactions and events were not studied consistently in all of the exercise studies, but their risk is considered to be low if the appropriate exercise is recommended after thorough assessment by a trained healthcare professional.

A summary of the studies examining the role of exercise in the management of osteoarthritis is provided overleaf.

Study citation	Research design	Sample size (Number of patients)	Interventions studied	Outcomes studied	Outcome of study
Roddy E, Zhang W, Doherty M. Aerobic walking or strengthening exercise for osteoarthritis of the knee? A systematic review. <i>Annals of the Rheumatic Diseases</i> . 2005;64(4):544-8.	Meta-analysis	449	Aerobic exercise compared with no exercise as a control	Pain	Study favoured the use of exercise
Roddy E, Zhang W, Doherty M. Aerobic walking or strengthening exercise for osteoarthritis of the knee? A systematic review. <i>Annals of the Rheumatic Diseases</i> . 2005;64(4):544-8.	Meta-analysis	2004	Home-based quadriceps strengthening exercise vs control of no exercise	Pain	Study favoured the use of exercise
Tak ES. The effects of an exercise programme for older adults with osteoarthritis of the hip. <i>J Rheumatol</i> .	Randomised controlled trial (RCT)	94	Strength training exercise and home exercise vs control of no exercise	1. Self-reported pain (visual analogue score [VAS]) 2. Harris Hip Score [HHS])	Study favoured the use of exercise

2005;32(6):1106-13.					
Messier SP, Thompson CD, Ettinger WH Jr <i>et al.</i> Effects of long term aerobic or weight training regimens on gait in older, osteoarthritic population. <i>J Appl Biomech.</i> 1997;13(2):205-25.	RCT	103	Aerobic training exercise groups vs health education, and weight training exercise groups vs health education	1. Intensity and frequency of transfer pain e.g. getting in and out of the care or in and out of bed 2. Intensity and frequency of pain on ambulation	Study favoured the use of exercise for intensity and frequency of transfer pain, but was not-significant for ambulatory symptoms
Brismee JM, Paige RL, Chyu MC <i>et al.</i> Group and home based tai chi in elderly subjects with knee osteoarthritis: a randomised controlled trial. <i>Clinical Rehabilitation.</i> 2007;21(2):99-111	RCT	41	Tai chi exercise vs an attention control (involving attending health lectures)	1. Mean overall knee pain measured with VAS 2. Mean maximum knee pain measured with VAS	Study favoured the use of exercise for both scores mid treatment but was not significant for either score when measured post treatment
Thorstensson CA, Roos EM, Petersson IF <i>et al.</i> Six-week high-intensity exercise programme for middle-aged patients with knee osteoarthritis: a randomised controlled trial. <i>BMC Musculoskeletal Disorders.</i> 2005;6(27)	RCT	61	Weight-bearing exercise vs non treatment as a control	Pain measured using the Knee injury Osteoarthritis Outcome Score (KOOS)	Not significant when measured at 6 months post intervention

Van Baar ME, Dekker J, Oostendorp RA <i>et al.</i> Effectiveness of exercise in patients with osteoarthritis of hip or knee: nine months' follow up. <i>Annals of Rheumatic Diseases.</i> 2001;60(12):1123-1130	RCT	183	Strengthening exercise vs educational advice	Pain score using VAS	Not significant when measured at 9 months post intervention
Borjesson M, Roberston E, Weidenhielm L <i>et al.</i> Physiotherapy in knee osteoarthritis: effect on pain and walking. <i>Physiotherapy Research International.</i> 1996;1(2):89-97.	RCT	68	Strengthening exercise vs no treatment as a control	Pain during walking measured using Borg – 11 grade scale	Not significant when outcome assessed at the end of the study
Lefler C and Armstrong WJ. Exercise in the treatment of osteoarthritis in the hands of the elderly. <i>Clinical Kinesiology.</i> 2004;58(2):1-6	RCT	19	Strength training vs usual treatment	Pain measured using a six-point rating scale	Not significant when outcome assessed at the end of the study
Fransen M, Nairn L, Winstanley J <i>et al.</i> Physical activity for osteoarthritis management: a randomised controlled trial evaluating hydrotherapy or tai chi	RCT	152	Tai chi vs an attention control (involving being on the waiting list for tai chi classes)	Pain measured using the Western Ontario and McMaster Universities Arthritis Index	Not significant when outcome assessed at the end of the study

classes. <i>Arthritis and Rheumatism</i> . 2007;57(3):407-14.					
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In summary, the evidence indicates that exercise should be a core treatment in the management of osteoarthritis, irrespective of age, comorbidity, pain severity or disability. This should include local muscle strengthening and general aerobic fitness¹⁶. Further combinations of exercise and manual therapy have been studied and these will be reviewed in a future edition of *The Osteopath*.

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