OXFORD UNIVERSITY PRESS | British Medical Bulletin

PHYSIOTHERAPY MANAGEMENT OF LOWER LIMB OSTEOARTHRITIS

Journal:	*British Medical Bulletin*
Manuscript ID	Draft
Manuscript Type:	Invited Review
Date Submitted by the Author:	n/a
Complete List of Authors:	Walsh , Nicki Pearson, Jennifer Healey, Emma ; Arthritis Research UK Primary Care Centre
Keywords:	

Physio for OA

Title

PHYSIOTHERAPY MANAGEMENT OF LOWER LIMB OSTEOARTHRITIS

Authors

Nicola E Walsh[1], Jennifer Pearson[1], Emma L Healey[2]

1. Centre for Health and Clinical Research, Faculty of Health and Applied Sciences, University of the West of England Bristol, UK

2. Arthritis Research UK Primary Care Centre, Research Institute for Primary Care and Health Sciences, Keele University, UK

Corresponding Author

Professor Nicola Walsh
Faculty of Health and Applied Sciences
Glenside Campus
UWE Bristol
Blackberry Hill
Bristol
BS16 1DD
+44 (0)117 328 8801
nicola.walsh@uwe.ac.uk

Short Title

Physio for OA

ABSTRACT

Background: Osteoarthritis (OA) of the lower limb affects millions of people worldwide, and results in pain and reduced function. We reviewed guidelines and Cochrane reviews for physical therapy interventions to manage the condition.

Sources of data: Evidence from meta-analyses and systematic reviews was included. We also identified the recommendations from guidelines relevant to practice in the UK.

Areas of agreement: There is strongest evidence to support the use of exercise to improve pain, function and quality of life.

Areas of controversy: There is limited evidence to support the use of some commonly utilised physiotherapy interventions. NICE do not recommend the use of acupuncture.

Growing points: Programmes that include single exercise type may be more beneficial than combined strengthening and aerobic interventions.

Areas timely for developing research: Further research is required to determine how to facilitate long-term engagement with exercise to sustain the beneficial effects on pain, function and quality of life. Studies that investigate packages of care, combining interventions require further investigation.

Key Words: Osteoarthritis; Physiotherapy; Evidence

INTRODUCTION (270)

Osteoarthritis (OA) is prevalent, disabling and has significant impact on health and social care resources, with approximately 8.75 million people affected in the UK (1-2). The knee, hip and hand joints are predominantly involved, resulting in physical symptoms of pain, swelling and reduced function; and psychosocial symptoms of anxiety depression and reduced quality of life (3). Primary care data suggest that 1 in 100 adults are newly diagnosed with the condition during the course of a year (4). Diagnosis is most common in middle (over 45 years) and older age adults, but of interest is the increasing trend in incidence in people age 35-44 years (4).

The disease is generally managed within primary care, with more than one million annual GP consultations in the UK resulting from OA (2). At present there is no cure for the disease, as such interventions are aimed at pain management with simple analgesia, and maximising function and enhancing quality of life through non-pharmacological approaches (5).

Whilst some treatments are recommend, previous research suggests that management is frequently suboptimal, including under-utilisation of clinically and cost-effective non-pharmacological interventions such as exercise and education, and inappropriate pharmacological management through inadequate prescription (6-8). Given the current recommendations, most people who receive interventions for their OA are either managed by their GP (pharmacological) or physiotherapists for other physical therapy approaches, generally consisting of exercise with or without self-management interventions; manual therapy, including joint mobilisation and manipulation; transcutaneous electrical neuromuscular facilitation (TENS), an electrotherapeutic pain relieving device; and acupuncture. This paper reviews the evidence for physiotherapy interventions for lower limb OA recommended in guidelines relevant to practice in the UK.

METHODS

Database searches were performed using MEDLINE, EMBASE, the Cochrane Library, National Institute for Health and Clinical Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN). Keywords search terms were applied to titles and abstracts, and included arthrit$; education$; electrother$; exercise; manual$; osteoarthr$; pain; physical; physio$; self-management; treatment$. Due to the abundance of literature in this area, papers were limited to meta-analyses or systematic reviews of clinical-effectiveness and published between 2010 and 2016. We also searched for guidelines and recommendations published by NICE, SIGN, Osteoarthritis Research Society International (OARSI) and the European League Against Rheumatism (EULAR). The original search was undertaken in May 2016 and reviewed in October 2016 to identify any contemporary publications that would inform the evidence.

RESULTS

The search identified management guidelines from NICE (9), OARSI (10) and EULAR (11). American College of Rheumatology (12) and the Royal Australian College of General Practitioners (13) guidelines were also identified, but given the presence on National, European and OARSI documentation, the former were considered less relevant to UK practice. Table 1 identifies the recommendations for physiotherapy interventions included within the guidelines (9-11).

All guidelines recommended the use of exercise and education/self-management as key interventions for OA. NICE recommended the use of manual therapy (manipulation and stretching) as an adjunct to exercise, particularly in people with hip OA; manual therapy was not included within the other two publications (OARSI stated this modality was not included due to insufficient evidence. TENS was recommended for use as an adjunct to core treatments by NICE, whilst OARSI were uncertain regarding recommendation due to low quality evidence and no statistically different findings between TENS and sham treatments; EULAR did not include this modality. Acupuncture was categorically not recommended by NICE, yet OARSI expressed uncertainty regarding recommendation as clinical levels of significance were not demonstrated; this was not included in EULAR recommendations. OARSI included therapeutic ultrasound, although suggested an uncertain recommendation due to conflicting evidence; this modality was not included by NICE or EULAR.

The literature identified by the systematic search was reviewed to provide further evidence to inform clinical decision making. This is included below for each modality.

Exercise

<u>Effectiveness of therapeutic exercise</u>

A variety of systematic reviews identified evidence for the benefits of exercise and physical activity. Uthman et al (14) included 60 trials covering 12 interventions with outcomes from 8218 patients, concluding that there was definitive evidence demonstrating the significant benefits of exercise over a no exercise control. A variety of exercise interventions were

included, and outcomes for pain on a 10cm VAS demonstrated: strengthening (-2.03cm, 95% CI -2.82 to -1.26, large effect size); flexibility plus strengthening, (-1.26cm, 95% CI -2.12 to -0.40 medium effect size); flexibility, plus strengthening, plus aerobic (-1.74cm, 95% CI -2.60 to -0.88 medium effect size); aquatic strengthening (-1.87cm, 95% CI -3.56 to -0.17 medium effect size); and aquatic, plus flexibility, plus strengthening (-1.87cm, 95% CI -4.11 to -0.68 large effect size). In terms of the best intervention for lower limb OA, analysis suggested aquatic strengthening plus aerobic flexibility exercise was closely followed by strengthening only, and then aquatic strengthening plus aerobic. In the trials identified in the review by Fransen et al (15), high quality evidence from 9 RCTs (n=549) confirmed these findings that exercise reduced pain (SMD 0.38, 95% CI -0.55- -0.20) and also demonstrated the positive effects on physical function (SMD -0.38, 95% CI -0.54 - -0.05) immediately after treatment. Reduction in pain and improvement in physical function was also sustained 3-6 months after treatment.

A review by Loew et al (16) investigated the effects of walking interventions, and identified 7 out of 10 papers with high methodological quality. They found strong evidence that demonstrated statistically significant and clinically important benefits of an aerobic walking programme versus control for improved aerobic capacity post treatment but this was not sustained. Global effect demonstrated a standardised mean difference (SMD) of -0.47 (95% confidence interval (CI) -0.71 to -0.23). The greatest improvements were found in pain, QOL and functional status.

Optimising therapeutic exercise

The findings of Juhl et al (17) showed best effects were found for supervised exercise, carried out 3 times per week which comprised of at least 12 sessions. They included 48 trials and similar results were found for aerobic, resistance and performance exercise (SMD 0.67, 0.62, 0.48 respectively, P=0.733). Single type exercise programs were found to be more efficacious than those that included a range of difference exercise types and the effect increased with number of sessions and more pain reduction occurred when exercise was performed at least 3 times per week. No impact of intensity or duration of the sessions was found.

Regnaux et al (18) included six studies (n=656) that compared high- and low-intensity exercise programs; five studies exclusively recruited people with knee OA (n=620). Although they found the overall quality of evidence to be low, the evidence indicated reduced pain on a 20-point WOMAC pain scale for high intensity exercise (SMD -0.84, 95% CI -1.63 to -0.04; 4% absolute reduction, 95% CI -8% to 0%; number needed to treat for an additional beneficial outcome (NNTB) 11, 95% CI 14 to 22) and improved physical function on the 68-point WOMAC disability subscale (SMD -2.65, 95% CI -5.29 to -0.01; 4% absolute reduction; NNTB 10, 95% CI 8 to 13) immediately at the end of the exercise programs (from 8 to 24 weeks). However, none of these small improvements continued at long-term follow-up (up to 40 weeks after the end of the intervention). The authors were uncertain of the effect on quality of life, as only one study reported this outcome (0 to 200 scale; SMD 4.3, 95% CI -6.5 to 15.2; 2% absolute reduction; very low level of evidence).

Self-management education interventions

A Cochrane review by Kroon et al (19) included 29 studies (n=6753) comparing self-management education (SME) programmes to attention control, usual care or alternative interventions. Overall results suggested that at best programmes have small benefits, and adverse effects are unlikely. Analysis showed that at 12 months SME participation did not result in significant benefits compared to attention control. They found low-quality evidence from one study indicating that self-management skills were similar in active and control groups; the mean difference between groups was 0.4 points (95% confidence interval (CI) -0.39 to 1.19). A further four low quality studies indicated that SME programmes resulted in a statistically small but clinically non-meaningful reduction in pain: the standardised mean difference (SMD) between groups was -0.26 (95% CI -0.44 to -0.09); number needed to treat for an additional beneficial outcome (NNTB) of 8 (95% CI 5 to 23). Low-quality evidence from a further study indicated the mean global osteoarthritis score was 4.2 on a 0-10 scale in the control group, and with treatment symptoms reduced by a mean of 0.14 points (95% CI -0.54 to 0.26). Three further low quality studies demonstrated no significant difference in function between groups (SMD -0.19, 95% CI -0.5 to 0.11); mean function was 1.29 points on a 0-3 scale in the control group; SME treatment produced a mean improvement of 0.04

points (95% CI -0.10 to 0.02). One low-quality study investigating quality of life showed no between-group difference (MD -0.01, 95% CI -0.03 to 0.01).

Eleven moderate quality studies (n=1706) demonstrated that when compared to usual care, SME interventions benefits may provide small, long-term benefits (<21 months) in pain and function, but no improvement in quality of life. Furthermore the authors questioned whether the observed improvements equated to clinical importance. Withdrawal rates throughout were similar for all interventions.

A further analysis by Brand et al (20) comparing SME with or without exercise, identified 24 randomised controlled trials or cohort studies (n=3163) that used the Arthritis Self-Efficacy Scale (ASES) (21). The results from these studies demonstrated small to moderate effect sizes irrespective of whether the intervention combined SME with exercise. When considering the duration of interventions, Carnes (22) reported that self-management programmes that included a healthcare professional delivery, and were group based were more beneficial. The authors also reported that longer duration interventions (>8 weeks) did not equate to improved outcomes. Data also suggested that interventions which included a psychological component were consistently slightly more beneficial – there was insufficient information to determine which specific components were predominantly beneficial.

Manual Therapy

A systematic review undertaken by French et al (23) investigating the effects of manual therapy on pain and function identified four eligible RCTs (n=280), three included participants with knee OA and the other studies hip OA. The heterogeneity of interventions precluded met-analysis – studies included high velocity manipulations, stretching and traction, massage and myofascial trigger point release. The authors determined a potentially high risk of bias in two of the included studies. One study compared manual therapy to no treatment control, another to a placebo intervention manual therapy and electrotherapy intervention. Two studies compared manual therapy to alternative pharmacological and exercise interventions. The evidence suggested that short-term benefits on pain and function, particularly in patients with Knee OA (compared with no intervention) and hip OA

(compared to exercise). Long-term effects (6 months) were measured in one study and whilst some clinical benefits were sustained, effects sizes had diminished.

From the limited evidence available, the authors concluded that 'silver level of evidence' was available to support the use of manual therapy for hip OA, but the evidence for the intervention for knee OA was less convincing and based on low quality studies.

Acupuncture

A Cochrane review conducted by Manheimer et al (24) identified 16 trials (n=3498) of people with hip and knee OA. Statistically, results were in favour of acupuncture compared with a sham control, for pain (SMD -0.28, 95% CI -0.45 to -0.11; 0.9 point greater improvement than sham on 20 point scale; absolute percent change 4.59%; relative percent change 10.32%; 9 trials; 1835 participants); functional outcomes were also statistically significant function (-0.28, -0.46 to -0.09; 2.7 point greater improvement on 68 point scale; absolute percent change 3.97%; relative percent change 8.63%). However the authors state that the results failed to reach clinical relevance, defined as 1.3 points for pain; 3.57 points for function. A further analysis on wait list control did suggest statistical and clinical relevance, but conclusions were this 'may be due to expectation or placebo effects'.

A subsequent systematic review conducted by Manyanga et al (25) included 12 trials (n=1763) comparing the intervention to either sham acupuncture, usual care or no treatment. Whilst the authors recognised most trials had an unclear risk of bias (64%), or high risk of bias (9%), they demonstrated statistically significant reductions in pain intensity (MD -0.29, 95% CI -0.55 to -0.02), functional mobility (standardized MD -0.34, 95% CI -0.55 to -0.14), health-related quality of life (standardized MD -0.36, 95% CI -0.58 to -0.14). A further sub-group analysis suggested that interventions of more than four weeks resulted in greater pain reduction. The authors of this study concluded that the use of acupuncture as an alternative analgesic is supported by the current evidence.

Therapeutic Ultrasound

A Cochrane review (26) identified evidence for the use of therapeutic ultrasound (TUS) for people with knee OA, although no trials were available investigating the effectiveness in hip OA. Whilst the quality of evidence was poor, based on limited numbers, and with a diversity of dosage, meta-analysis suggested there was a beneficial effect on pain compared to control interventions; a SMD of -0.49 (95% CI -0.76 to -0.23), equating to a pain score difference of 1.2 cm on a 10-cm VAS between ultrasound and control. The numbers needed to treat was 6 (95% CI 5 to 12). For function, results suggested a trend towards effectiveness. Analysis suggested a SMD of -0.64 (95% CI -1.42 to 0.14, P value = 0.11); this corresponded to a difference in WOMAC disability scale function scores of 1.3 units (ranging from 0 to 10) favouring ultrasound therapy. Numbers needed to treat were not calculated given the statistically insignificant result. There were no reported concerns regarding safety of this intervention.

The authors concluded that TUS may have potential to improve pain and possibly function in people with knee OA, but the quality of evidence limits the certainty of true effect size and the meaningful clinical benefits of the intervention.

DISCUSSION

Management guidelines for lower limb OA exclusively recommend exercise as the most effective intervention, resulting in clinically meaningful outcomes for pain and function. Self-management education interventions are also recommended. The recommendation of other common physiotherapy modalities is inconclusive. NICE (9) suggest that manual therapy techniques and TENS be considered in addition to exercise interventions, whilst OARSI (10) conclude that there is insufficient evidence available to determine the effectiveness of manual techniques, and that there is no conclusive evidence to support or refute the use of TENS. Acupuncture is conclusively not recommended by NICE, whilst OARSI suggest that the evidence is uncertain given the statistically significant findings of trials, but the lack of clinically meaningful outcomes reported. OARSI also concluded that the evidence for the use of therapeutic ultrasound was uncertain, particularly because low quality trials were reported; NICE did not include this intervention in their guidelines.

Therapeutic exercise

Areas of Agreement: Overall, the general consensus from the reviews examining the role of therapeutic exercise is that in the short term it is beneficial for pain and function in those with hip and knee OA. Of interest, Uthman et al (14) concluded that as of 2002 there was enough accumulated evidence demonstrating the significant benefit of exercise over no exercise and a combination of strengthening exercise with exercise aimed at increasing flexibility and aerobic capacity seem to be the 'best' exercise option physiotherapists can offer patients. This is in line with the OARSI recommendations that state OA patients should be encouraged to undertake regular aerobic, muscle strengthening and range of movement exercises (10).

Areas of Controversy: Current guidelines relevant to UK practice report there is limited evidence for the benefit of one exercise type over another and recommend both strengthening and aerobic exercise as 'core' treatment. Unfortunately such guidelines fall short of providing any type of prescription for this patient population regarding dose intensity, frequency and duration. The findings of Juhl et al (17) stated that optimal exercise for those with OA is supervised exercise, carried out 3 times per week which comprises of at least 12 sessions. In contrast with the findings of Uthman et al (14) they stated that single

type exercise programs were found to be more efficacious than those that included a range of difference exercise types. No impact of intensity or duration of the sessions was found. In terms of intensity Regnaux et al (18) stated that people with knee OA who perform high-intensity exercise may experience slight improvements in knee pain and function compared with a low-intensity exercise program. However they were unable to determine as to whether high-intensity exercise improves quality of life or increases the number of people who experience adverse events, furthermore these findings were predominately based on low quality trials.

Growing Points: The results of reviews on this topic, such as the network meta-analysis by Uthman et al (14), may be to be useful for policy makers, service commissioners and care providers when they make choices between multiple alternatives for physiotherapist led OA management.

Areas Timely for Developing Research: There is an obvious lack of long-term follow-up in the trials reported. Further research is required to evaluate methods of helping people with OA to maintain long-term exercise as poor adherence may limit long term effectiveness. High quality randomised controlled trials with long-term follow-up that explicitly addresses adherence to exercise are needed. Jordan et al (27) stated that a standard validated measure of exercise adherence would be welcomed and should be used consistently in future studies. The evidence to date also relies on results from interventions delivered by healthcare professionals. Given the growing numbers of people affected by OA, and the limited availability of healthcare resources, alternative providers of exercise (e.g. community based exercise professionals) should also be investigated to determine whether this is a safe, effective approach – a Cochrane review of this approach is currently being undertaken (28).

Self-management Education interventions

Areas of agreement

Whilst effect sizes are conservative, there is general agreement that educating patients about their disease, dispelling myths around the causes, and developing appropriate skills to facilitate self-management are beneficial.

Areas of controversy

Recent guidelines support the principles of SME in clinical practice (9). However, evidence from the recent Cochrane review is less convincing; reporting low to moderate quality evidence and a relatively small effect size (19).

Growing points

Investigating the most appropriate and effective components of self-management interventions is required, including overt documentation of techniques employed. Mapping against the behavioural change taxonomy may allow for better implementation into practice (29).

Areas timely for developing research.

Further studies investigating the clinical and cost-effectiveness of on-line self-management education are warranted.

Manual Therapy

Areas of Agreement; There is very little evidence available to determine the effectiveness of manual therapy. Whilst it appears to be safe, current evidence does not justify its use as a single intervention in clinical practice.

Areas of Controversy; Although there is limited low quality evidence for the benefits of manual therapy for knee and hip OA, NICE recommend this intervention as an adjunct to core interventions of exercise and self-management education.

Growing points; Usual physiotherapy practice is unlikely to include manual therapy as a single intervention, so a greater understanding of combined interventions is required. A Cochrane review investigating the effectiveness of adjunctive therapies (including manual therapy) in combination with exercise is investigating this approach (30). Recent studies investigating the added benefits of manual therapy over exercise show conflicting results. Abbott et al (31) report that at one year post intervention, adjusted reductions in WOMAC scores were observed for usual care plus exercise therapy 16.4 (-3.2 to 35.9), and for usual care plus combined exercise therapy and manual therapy 14.5 (-5.2 to 34.1), but there were no added benefits of manual therapy. This is also supported by a study by French et al (32)

who found no significant difference in physical function measures between the exercise therapy group and exercise plus manual therapy at 9 weeks (mean difference, .09; 95% confidence interval [CI] -2.93 to 3.11) or 18 weeks (mean difference, .42; 95% CI, -.41 to 5.25).

Areas for further research; Manual therapy includes many different techniques, applied at different doses, so future research should seek to establish which interventions are most beneficial. French and colleagues (32) also suggest that the skill and level of experience of the treating therapist may also be an important factor to consider in future studies.

Acupuncture

Areas of Agreement; Acupuncture demonstrates a small benefit compared with sham acupuncture.

Areas of Controversy; NICE conclusively do not recommend the use of acupuncture for lower limb OA due to its lack of added benefit compared to the sham intervention. Inconsistencies in recommendations are likely due to the consideration of most appropriate comparator. Some experts in the field have questioned the decision to compare to sham findings, stating that decisions were 'based on a desire to avoid ethical problems in promoting therapies whose effects may derive largely from placebo' (33).

Growing Points; The reported similarity in benefits of acupuncture compared to the sham intervention raise the question of the impact of placebo effect. Authors are questioning whether we should use placebo for our advantage in treating OA (34)

Areas for further research; Definitive high quality trials of acupuncture are required that consider the most appropriate intervention comparator and determine the level of clinically meaningful difference.

Therapeutic Ultrasound

Areas of Agreement; At present there is no evidence to support the use of therapeutic ultrasound in hip OA, but there is limited evidence to suggest that there may be benefits in knee OA.

Areas of Controversy; NICE do not include any recommendation regarding therapeutic ultrasound within their guidelines, yet this is a standard intervention available to physiotherapists.

Growing Points: An updated Cochrane review suggested TUS may be beneficial for people with knee OA. The authors report that in contract to their original review, four further studies were identified, although methodological quality of the studies was judged as poor. For pain outcomes, the benefits of ultrasound corresponded to a difference in pain scores of -1.2 cm on a 10-cm VAS (95% CI -1.9 to -0.6 cm); and functional scores of -1.3 units on a standardised WOMAC disability scale ranging from 0 to 10 (95% CI -3.0 to 0.3). A recent study not included within the Cochrane review suggested that TUS did not provide any additional benefit to exercise in improving pain and function (35)

Areas for further research; High quality studies are required to provide definitive evidence of the clinical benefits of TUS for people with knee and hip OA.

CONCLUSION

Physiotherapy management for OA consists of a variety of interventions. Whilst there is strong evidence for the therapeutic benefits of exercise, there are fewer high quality studies demonstrating the benefits of other modalities. Given the growing numbers of people affected by OA and the limited availability of healthcare resources, there is a strong argument to suggest that practitioners focus on educating patients about the benefits of exercise, and facilitating continued exercise participation in people with OA.

REFERENCES

1. Chen A, Gupte C, Akhtar K et al. The Global Economic Cost of Osteoarthritis: How the UK Compares. Arthritis 2012; 2012 doi:10.1155/2012/698709
2. Arthritis Research UK. Osteoarthritis in General Practice: Data and perspectives. 2013
3. Litwic A, Edwards M, Dennison E, Cooper C. Epidemiology and Burden of Osteoarthritis. British Medical Bulletin 2013, 105: 185–199.
4. Yu D, Peat G, Bedson J, Jordan KP. Annual consultation incidence of osteoarthritis estimated from population-based health care data in England. Rheumatology 2015;54:20512060 doi:10.1093/rheumatology/kev231
5. Hagen KB, Smedslund G, Osteras N, Jamtvedt G. Quality of Community-Based Osteoarthritis Care: A Systematic Review and Meta-Analysis. Arthritis Care & Research 2016; 68; 1443–1452
6. Poitras S, Rossignol M, Avouac J et al. Management recommendations for knee osteoarthritis: how usable are they? Joint Bone Spine 2010;77:45865.
7. Conrozier T, Marre JP, Payen-Champenois C et al. National survey on the non-pharmacological modalities prescribed by French general practitioners in the treatment of lower limb (knee and hip) osteoarthritis. Adherence to the EULAR recommendations and factors influencing adherence. Clin Exp Rheumatol 2008;26: 7938.
8. Sarzi-Puttini P, Cimmino MA, Scarpa R et al. Do physicians treat symptomatic osteoarthritis patients properly? Results of the AMICA experience. Semin Arthritis Rheum 2005;35:3842.
9. National Institute of Health and Clinical Excellence. Osteoarthritis: care and management. 2017; CG177
10. Zhang W, Nuki G, Moskowitz RW, et al. OARSI recommendations for the management of hip and knee osteoarthritis: part lll: Changes in evidence following systematic cumulative update of research published through January 2009. Osteoarthritis and Cartilage 2010; 18: 476-99.
11. Fernandes L, Hagen KB, Bijlsma JWJ. EULAR recommendations for the non-pharmacological management of hip and knee osteoarthritis. Annals of the Rheumatic Diseases 2013 doi:10.1136/annrheumdis-2012-202745
12. Hochberg M, Altman RD, April KT et al. American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. Arthritis Care and Research 2012; 64: 465-74
13. RACGP. Guideline for the non-surgical management of hip and knee osteoarthritis. 2009

14. Uthman OA, van der Windt D, Jordan J, Dziedzic KS, Healey EL, Peat GM, Foster NE. Exercise for lower limb osteoarthritis: systematic review incorporating trial sequential analysis and network meta-analysis. BMJ 2013;347:f5555.
15. Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S. Exercise for osteoarthritis of the hip. Cochrane Database of Systematic Reviews 2014, Issue 4. Art. No.: CD007912. DOI: 10.1002/14651858.CD007912.pub2.Jordan et al (2010)
16. Loew L, Brosseau L, Wells GA, Tugwell P, Kenny GP, Reid R, et al, and the Ottawa Panel. Ottawa Panel Evidence-Based Clinical Practice Guidelines for Aerobic Walking Programs in the Management of Osteoarthritis. Arch Phys Med Rehabil 2012; 93: 1269-85.
17. Juhl C, Christensen R, Roos EM et al. Impact of exercise type and dose on pain and disability in knee osteoarthritis: a systematic review and meta-regression analysis of randomized controlled trials. Arthritis Rheumatol. 2014 Mar;66(3):622-36. doi: 10.1002/art.38290
18. Regnaux JP, Lefevre-Colau MM, Trinquart L, Nguyen C, Boutron I, Brosseau L, Ravaud P. High-intensity versus low-intensity physical activity or exercise in people with hip or knee osteoarthritis. Cochrane Database of Systematic Reviews 2015, Issue 10. Art. No.: CD010203. DOI: 10.1002/14651858.CD010203.pub2.
19. Kroon FP, van der Burg LR, Buchbinder R et al. Self-management education programmes for osteoarthritis. Cochrane Database Syst Rev. 2014 Jan 15;(1):CD008963. doi: 10.1002/14651858.CD008963.pub2.
20. Brand E, Nyland J, Henzman C, Mcginnis, M. Arthritis self-efficacy scale scores in knee osteoarthritis: a systematic review and meta-analysis comparing arthritis self-management education with or without exercise. Journal of Orthopaedic & Sports Physical Therapy, 2013 43(12), pp.895-910.
21. Lorig K, Chastain R, Ung E et al. Development and evaluation of a scale to measure the perceived self-efficacy of people with arthritis. Arthritis and Rheumatism, 1989 32(1), 37-44.
22. Carnes D, Homer KE, Miles CL et al. Effective delivery styles and content for self-management interventions for chronic musculoskeletal pain: a systematic literature review. The Clinical Journal of Pain 2012 28(4), pp.344-354.
23. French HP, Brennan A, White B, Cusack T. Manual therapy for osteoarthritis of the hip or knee: a systematic review. Manual Therapy 2011; 16(2): 109-117
24. Manheimer E, Cheng K, Linde K et al. Acupuncture for peripheral joint osteoarthritis. Cochrane Database of Systematic Reviews 2010. 2010, Issue 1. Art. No.: CD001977. DOI: 10.1002/14651858.CD001977.pub2.
25. Manyanga T, Froese M, Zarychanski R. Pain management with acupuncture in osteoarthritis: a systematic review and meta-analysis. BMC Complementary and Alternative Medicine 2014 Aug 23;14:312. doi: 10.1186/1472-6882-14-312.

26. Rutjes AW, Nüesch E, Sterchi R, Jüni P. Therapeutic ultrasound for osteoarthritis of the knee or hip. Cochrane Database Syst Rev. 2010 Jan 20;(1):CD003132. doi: 10.1002/14651858.CD003132.pub2.
27. Jordan JL, Holden MA, Mason EEJ, Foster NE. Interventions to improve adherence to exercise for chronic musculoskeletal pain in adults. Cochrane Database of Systematic Reviews 2010, Issue 1. Art. No.: CD005956. DOI: 10.1002/14651858.CD005956.pub2.
28. Walsh N, Jordan JL, Babatunde OO, Powell J, Healey EL. Community based exercise programmes led by non-healthcare exercise professionals for osteoarthritis [Protocol]. Cochrane Database of Systematic Reviews 2016, Issue 4. Art. No.: CD012166.DOI: 10.1002/14651858.CD012166.
29. Michie S, Richardson M, Johnston M et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med. 2013 Aug;46(1):81-95. doi: 10.1007/s12160-013-9486-6.
30. French HP, Galvin R, Abbott JH, Fransen M. Adjunctive therapies in addition to land-based exercise therapy for osteoarthritis of the hip or knee. Cochrane Database of Systematic Reviews 2015, Issue 10. Art. No.: CD011915. DOI: 10.1002/14651858.CD011915.
31. Abbott JH, Robertson MC, Chapple C. Manual therapy, exercise therapy, or both, in addition to usual care, for osteoarthritis of the hip or knee: a randomized controlled trial. 1: clinical effectiveness. Osteoarthritis Cartilage. 2013 Apr;21(4):525-34. doi: 10.1016/j.joca.2012.12.014. Epub 2013 Jan 8.
32. French HP, Cusack T, Brennan A et al. Exercise and Manual Physiotherapy Arthritis Research Trial (EMPART) for Osteoarthritis of the Hip: A Multicenter Randomized Controlled Trial. Archives of Physical Medicine and Rehabilitation 2013;94:302-14
33. Bovey M. Acupuncture for osteoarthritis in the UK: A turning point for NICE? European Journal of Integrative Medicine Volume 8, Issue 4, August 2016, Pages 337–341.
34. de Campos GC. Placebo effect in osteoarthritis: Why not use it to our advantage? World J Orthop. 2015 Jun 18; 6(5): 416–420.
35. Cakir S, Hepguler S, Ozturk C, et al. Efficacy of therapeutic ultrasound for the management of knee osteoarthritis: a randomized, controlled, and double-blind study. Am J Phys Med Rehabil. 2014 May;93(5):405-12.

Table 1 Physiotherapy intervention recommendations from NICE, OARSI and EULAR

MODALITY	NICE (9)	OARSI (10)	EULAR (11)
Exercise	• Advise people with osteoarthritis to exercise as a core treatment, irrespective of age, comorbidity, pain severity or disability. Exercise should include: local muscle strengthening and general aerobic fitness	• Recommendation: Appropriate • Rationale: Four recent meta-analyses found small but clinically relevant short-term benefits of land-based exercise for pain and physical function in knee. Meta-analyses investigating T'ai chi found strong favourable benefits of T'ai chi for improving pain and physical function in individuals with knee OA. The duration and type of exercise programs included in these meta-analyses varied widely, but interventions included a combination of elements including strength training, active range of motion exercise, and aerobic activity. Results were generally positive among land-based exercise type, and did not significantly favour any specific exercise regimens	• People with hip and/or knee OA should be taught a regular individualised (daily) exercise regimen that includes: a) strengthening (sustained isometric) exercise for both legs, including the quadriceps and proximal hip girdle muscles (irrespective of site or number of large joints affected); b) aerobic activity and exercise; c) adjunctive range of movement/stretching exercises
Education/self-management	• Offer accurate verbal and written information to all people with osteoarthritis to enhance understanding of the condition and its management, and to counter misconceptions. Ensure that information sharing is an ongoing, integral part of the management plan rather than a single event at time of presentation • Agree individualised self-management strategies with the person with osteoarthritis	• Recommendation: Appropriate • Analysis of arthritis-related disability showed only modest benefit. Recent randomized clinical trials indicated significant clinical benefits of self-management and suggested feasibility of implementation in primary care by means of group sessions and telephone-based sessions. Another RCT expressed reservations about the efficacy and practicality of such interventions.	• To be effective, information and education for the person with hip or knee OA should: a) be individualised according to the person's illness perceptions and educational capability; b) be included in every aspect of management; c) specifically address the nature of OA, its causes (especially those pertaining to the individual), its consequences and prognosis; d) be reinforced and developed at subsequent clinical encounters; e) be supported by written and/or other types of information selected by the individual; f) include partners or carers of the individual, if appropriate

Table 1 Physiotherapy intervention recommendations from NICE, OARSI and EULAR

Manual Therapy	• Manipulation and stretching should be considered as an adjunct to core treatments, particularly for osteoarthritis of the hip	• Manual therapy was not included in these guidelines due to insufficient available evidence	• Not included
TENS	• Healthcare professionals should consider the use of transcutaneous electrical nerve stimulation as an adjunct to core treatments for pain relief	• Recommendation: Uncertain • A SR found inconclusive results regarding the effect of TENS for pain relief in knee OA. Due to the low methodological quality and high heterogeneity of included trials, no effect size was reported as a primary result. The review found no evidence to suggest that TENS was unsafe. A recent RCT revealed no statistically significant difference for pain between TENS and a sham TENS procedure	• Not included
Acupuncture	• Do not offer acupuncture for the management of osteoarthritis	• Recommendation: Uncertain • A recent pooled analysis of 16 RCTs found statistically significant benefit of acupuncture in sham-controlled trials, though this did not reach the investigators' threshold for clinical significance	• Not included
Therapeutic Ultrasound	• Not included	• Recommendation: Uncertain • SRs suggested a possible beneficial effect of ultrasound for knee OA; however, the quality of the analyzed evidence was low. No safety risks were reported to be associated with ultrasound. A 2012 RCT found no significant differences between the groups for pain or function.	• Not included