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OSTEOARTHRITIS**

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1 **Title**

2 PHYSIOTHERAPY MANAGEMENT OF LOWER LIMB OSTEOARTHRITIS

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23 **Short Title**

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3 32 **ABSTRACT**
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5 33 **Background:** Osteoarthritis (OA) of the lower limb affects millions of people worldwide, and
6 34 results in pain and reduced function. We reviewed guidelines and Cochrane reviews for
7 35 physical therapy interventions to manage the condition.

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10 36 **Sources of data:** Evidence from meta-analyses and systematic reviews was included. We
11 37 also identified the recommendations from guidelines relevant to practice in the UK.
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14 39 **Areas of agreement:** There is strongest evidence to support the use of exercise to improve
15 40 pain, function and quality of life.
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17 41
18 42 **Areas of controversy:** There is limited evidence to support the use of some commonly
19 43 utilised physiotherapy interventions. NICE do not recommend the use of acupuncture.
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21 44
22 45 **Growing points:** Programmes that include single exercise type may be more beneficial than
23 46 combined strengthening and aerobic interventions.
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25 47
26 48 **Areas timely for developing research:** Further research is required to determine how to
27 49 facilitate long-term engagement with exercise to sustain the beneficial effects on pain,
28 50 function and quality of life. Studies that investigate packages of care, combining
29 51 interventions require further investigation.
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35 55 **Key Words:** Osteoarthritis; Physiotherapy; Evidence
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3 64 **INTRODUCTION (270)**
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5 65 Osteoarthritis (OA) is prevalent, disabling and has significant impact on health and social
6 care resources, with approximately 8.75 million people affected in the UK (1-2). The knee,
7 66 hip and hand joints are predominantly involved, resulting in physical symptoms of pain,
8 swelling and reduced function; and psychosocial symptoms of anxiety depression and
9 67 reduced quality of life (3). Primary care data suggest that 1 in 100 adults are newly
10 68 diagnosed with the condition during the course of a year (4). Diagnosis is most common in
11 69 middle (over 45 years) and older age adults, but of interest is the increasing trend in
12 70 incidence in people age 35-44 years (4).
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20 73 The disease is generally managed within primary care, with more than one million annual
21 74 GP consultations in the UK resulting from OA (2). At present there is no cure for the disease,
22 75 as such interventions are aimed at pain management with simple analgesia, and maximising
23 76 function and enhancing quality of life through non-pharmacological approaches (5).
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28 77 Whilst some treatments are recommend, previous research suggests that management is
29 78 frequently suboptimal, including under-utilisation of clinically and cost-effective non-
30 79 pharmacological interventions such as exercise and education, and inappropriate
31 80 pharmacological management through inadequate prescription (6-8). Given the current
32 81 recommendations, most people who receive interventions for their OA are either managed
33 82 by their GP (pharmacological) or physiotherapists for other physical therapy approaches,
34 83 generally consisting of exercise with or without self-management interventions; manual
35 84 therapy, including joint mobilisation and manipulation; transcutaneous electrical
36 85 neuromuscular facilitation (TENS), an electrotherapeutic pain relieving device; and
37 86 acupuncture. This paper reviews the evidence for physiotherapy interventions for lower
38 87 limb OA recommended in guidelines relevant to practice in the UK.
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3 93 **METHODS**
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5 94 Database searches were performed using MEDLINE, EMBASE, the Cochrane Library, National
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7 95 Institute for Health and Clinical Excellence (NICE) and the Scottish Intercollegiate Guidelines
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9 96 Network (SIGN). Keywords search terms were applied to titles and abstracts, and included
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11 97 arthrit\$; education\$; electrother\$; exercise; manual\$; osteoarthr\$; pain; physical; physio\$;
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13 98 self-management; treatment\$. Due to the abundance of literature in this area, papers were
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15 99 limited to meta-analyses or systematic reviews of clinical-effectiveness and published
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17 100 between 2010 and 2016. We also searched for guidelines and recommendations published
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19 101 by NICE, SIGN, Osteoarthritis Research Society International (OARSI) and the European
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21 102 League Against Rheumatism (EULAR). The original search was undertaken in May 2016 and
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23 103 reviewed in October 2016 to identify any contemporary publications that would inform the
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25 104 evidence.
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3 118 **RESULTS**
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5 119 The search identified management guidelines from NICE (9), OARSI (10) and EULAR (11).
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7 120 American College of Rheumatology (12) and the Royal Australian College of General
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9 121 Practitioners (13) guidelines were also identified, but given the presence on National,
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11 122 European and OARSI documentation, the former were considered less relevant to UK
12
13 123 practice. Table 1 identifies the recommendations for physiotherapy interventions included
14
15 124 within the guidelines (9-11).

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17 125 All guidelines recommended the use of exercise and education/self-management as key
18
19 126 interventions for OA. NICE recommended the use of manual therapy (manipulation and
20
21 127 stretching) as an adjunct to exercise, particularly in people with hip OA; manual therapy was
22
23 128 not included within the other two publications (OARSI stated this modality was not included
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25 129 due to insufficient evidence. TENS was recommended for use as an adjunct to core
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27 130 treatments by NICE, whilst OARSI were uncertain regarding recommendation due to low
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29 131 quality evidence and no statistically different findings between TENS and sham treatments;
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31 132 EULAR did not include this modality. Acupuncture was categorically not recommended by
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33 133 NICE, yet OARSI expressed uncertainty regarding recommendation as clinical levels of
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35 134 significance were not demonstrated; this was not included in EULAR recommendations.
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37 135 OARSI included therapeutic ultrasound, although suggested an uncertain recommendation
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39 136 due to conflicting evidence; this modality was not included by NICE or EULAR.

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41 137 The literature identified by the systematic search was reviewed to provide further evidence
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43 138 to inform clinical decision making. This is included below for each modality.

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46 140 **Exercise**

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49 141 Effectiveness of therapeutic exercise
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51 142 A variety of systematic reviews identified evidence for the benefits of exercise and physical
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53 143 activity. Uthman et al (14) included 60 trials covering 12 interventions with outcomes from
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55 144 8218 patients, concluding that there was definitive evidence demonstrating the significant
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57 145 benefits of exercise over a no exercise control. A variety of exercise interventions were
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3 146 included, and outcomes for pain on a 10cm VAS demonstrated: strengthening (-2.03cm,
4 147 95% CI -2.82 to -1.26, large effect size); flexibility plus strengthening, (-1.26cm, 95% CI -2.12
5 148 to -0.40 medium effect size); flexibility, plus strengthening, plus aerobic (-1.74cm, 95% CI -
6 149 2.60 to -0.88 medium effect size); aquatic strengthening (-1.87cm, 95% CI -3.56 to -0.17
7 150 medium effect size); and aquatic, plus flexibility, plus strengthening (-1.87cm, 95% CI -4.11
8 151 to -0.68 large effect size). In terms of the best intervention for lower limb OA, analysis
9 152 suggested aquatic strengthening plus aerobic flexibility exercise was closely followed by
10 153 strengthening only, and then aquatic strengthening plus aerobic. In the trials identified in
11 154 the review by Fransen et al (15), high quality evidence from 9 RCTs (n=549) confirmed these
12 155 findings that exercise reduced pain (SMD 0.38, 95% CI -0.55- -0.20) and also demonstrated
13 156 the positive effects on physical function (SMD -0.38, 95% CI -0.54 - -0.05) immediately after
14 157 treatment. Reduction in pain and improvement in physical function was also sustained 3-6
15 158 months after treatment.

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27 159 A review by Loew et al (16) investigated the effects of walking interventions, and identified
28 160 7 out of 10 papers with high methodological quality. They found strong evidence that
29 161 demonstrated statistically significant and clinically important benefits of an aerobic walking
30 162 programme versus control for improved aerobic capacity post treatment but this was not
31 163 sustained. Global effect demonstrated a standardised mean difference (SMD) of -0.47 (95%
32 164 confidence interval (CI) -0.71 to -0.23). The greatest improvements were found in pain, QOL
33 165 and functional status.

34 166 Optimising therapeutic exercise

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42 167 The findings of Juhl et al (17) showed best effects were found for supervised exercise,
43 168 carried out 3 times per week which comprised of at least 12 sessions. They included 48 trials
44 169 and similar results were found for aerobic, resistance and performance exercise (SMD 0.67,
45 170 0.62, 0.48 respectively, P=0.733). Single type exercise programs were found to be more
46 171 efficacious than those that included a range of difference exercise types and the effect
47 172 increased with number of sessions and more pain reduction occurred when exercise was
48 173 performed at least 3 times per week. No impact of intensity or duration of the sessions was
49 174 found.

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3 175 Regnaud et al (18) included six studies (n=656) that compared high- and low-intensity
4 176 exercise programs; five studies exclusively recruited people with knee OA (n=620). Although
5 177 they found the overall quality of evidence to be low, the evidence indicated reduced pain on
6 178 a 20-point WOMAC pain scale for high intensity exercise (SMD -0.84, 95% CI -1.63 to -0.04;
7 179 4% absolute reduction, 95% CI -8% to 0%; number needed to treat for an additional
8 180 beneficial outcome (NNTB) 11, 95% CI 14 to 22) and improved physical function on the 68-
9 181 point WOMAC disability subscale (SMD -2.65, 95% CI -5.29 to -0.01; 4% absolute reduction;
10 182 NNTB 10, 95% CI 8 to 13) immediately at the end of the exercise programs (from 8 to 24
11 183 weeks). However, none of these small improvements continued at long-term follow-up (up
12 184 to 40 weeks after the end of the intervention). The authors were uncertain of the effect on
13 185 quality of life, as only one study reported this outcome (0 to 200 scale; SMD 4.3, 95% CI -6.5
14 186 to 15.2; 2% absolute reduction; very low level of evidence).

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188 **Self-management education interventions**

30 189 A Cochrane review by Kroon et al (19) included 29 studies (n=6753) comparing self-
31 190 management education (SME) programmes to attention control, usual care or alternative
32 191 interventions. Overall results suggested that at best programmes have small benefits, and
33 192 adverse effects are unlikely. Analysis showed that at 12 months SME participation did not
34 193 result in significant benefits compared to attention control. They found low-quality evidence
35 194 from one study indicating that self-management skills were similar in active and control
36 195 groups; the mean difference between groups was 0.4 points (95% confidence interval (CI) -
37 196 0.39 to 1.19). A further four low quality studies indicated that SME programmes resulted in
38 197 a statistically small but clinically non-meaningful reduction in pain: the standardised mean
39 198 difference (SMD) between groups was -0.26 (95% CI -0.44 to -0.09); number needed to treat
40 199 for an additional beneficial outcome (NNTB) of 8 (95% CI 5 to 23). Low-quality evidence
41 200 from a further study indicated the mean global osteoarthritis score was 4.2 on a 0-10 scale
42 201 in the control group, and with treatment symptoms reduced by a mean of 0.14 points (95%
43 202 CI -0.54 to 0.26). Three further low quality studies demonstrated no significant difference in
44 203 function between groups (SMD -0.19, 95% CI -0.5 to 0.11); mean function was 1.29 points
45 204 on a 0-3 scale in the control group; SME treatment produced a mean improvement of 0.04

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

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

213

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

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225 **Manual Therapy**

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

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3 236 (compared to exercise). Long-term effects (6 months) were measured in one study and
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5 237 whilst some clinical benefits were sustained, effects sizes had diminished.

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7 238 From the limited evidence available, the authors concluded that 'silver level of evidence'
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9 239 was available to support the use of manual therapy for hip OA, but the evidence for the
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11 240 intervention for knee OA was less convincing and based on low quality studies.

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15 242 **Acupuncture**

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17 243 A Cochrane review conducted by Manheimer et al (24) identified 16 trials (n=3498) of
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19 244 people with hip and knee OA. Statistically, results were in favour of acupuncture compared
20
21 245 with a sham control, for pain (SMD -0.28, 95% CI -0.45 to -0.11; 0.9 point greater
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23 246 improvement than sham on 20 point scale; absolute percent change 4.59%; relative percent
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25 247 change 10.32%; 9 trials; 1835 participants); functional outcomes were also statistically
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27 248 significant function (-0.28, -0.46 to -0.09; 2.7 point greater improvement on 68 point scale;
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29 249 absolute percent change 3.97%; relative percent change 8.63%). However the authors state
30
31 250 that the results failed to reach clinical relevance, defined as 1.3 points for pain; 3.57 points
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33 251 for function. A further analysis on wait list control did suggest statistical and clinical
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35 252 relevance, but conclusions were this 'may be due to expectation or placebo effects'.

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37 253 A subsequent systematic review conducted by Manyanga et al (25) included 12 trials
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39 254 (n=1763) comparing the intervention to either sham acupuncture, usual care or no
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41 255 treatment. Whilst the authors recognised most trials had an unclear risk of bias (64%), or
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43 256 high risk of bias (9%), they demonstrated statistically significant reductions in pain intensity
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45 257 (MD -0.29, 95% CI -0.55 to -0.02), functional mobility (standardized MD -0.34, 95% CI -0.55
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47 258 to -0.14), health-related quality of life (standardized MD -0.36, 95% CI -0.58 to -0.14). A
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49 259 further sub-group analysis suggested that interventions of more than four weeks resulted in
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51 260 greater pain reduction. The authors of this study concluded that the use of acupuncture as
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53 261 an alternative analgesic is supported by the current evidence.

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3 265 **Therapeutic Ultrasound**

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5 266 A Cochrane review (26) identified evidence for the use of therapeutic ultrasound (TUS) for
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7 267 people with knee OA, although no trials were available investigating the effectiveness in hip
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9 268 OA. Whilst the quality of evidence was poor, based on limited numbers, and with a diversity
10
11 269 of dosage, meta-analysis suggested there was a beneficial effect on pain compared to
12
13 270 control interventions; a SMD of -0.49 (95% CI -0.76 to -0.23), equating to a pain score
14
15 271 difference of 1.2 cm on a 10-cm VAS between ultrasound and control. The numbers needed
16
17 272 to treat was 6 (95% CI 5 to 12). For function, results suggested a trend towards
18
19 273 effectiveness. Analysis suggested a SMD of -0.64 (95% CI -1.42 to 0.14, P value = 0.11); this
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21 274 corresponded to a difference in WOMAC disability scale function scores of 1.3 units (ranging
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23 275 from 0 to 10) favouring ultrasound therapy. Numbers needed to treat were not calculated
24
25 276 given the statistically insignificant result. There were no reported concerns regarding safety
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27 277 of this intervention.

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

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292 **DISCUSSION**

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

305 **Therapeutic exercise**

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

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

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

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

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

346 347 **Self-management Education interventions**

348 Areas of agreement

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

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352 Areas of controversy

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

356 Growing points

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

361 Areas timely for developing research.

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

364

365 **Manual Therapy**

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

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

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

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3 381 who found no significant difference in physical function measures between the exercise
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5 382 therapy group and exercise plus manual therapy at 9 weeks (mean difference, .09; 95%
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7 383 confidence interval [CI] -2.93 to 3.11) or 18 weeks (mean difference, .42; 95% CI, -.41 to
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9 384 5.25).

10
11 385 Areas for further research; Manual therapy includes many different techniques, applied at
12
13 386 different doses, so future research should seek to establish which interventions are most
14
15 387 beneficial. French and colleagues (32) also suggest that the skill and level of experience of
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17 388 the treating therapist may also be an important factor to consider in future studies.

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21 390 **Acupuncture**

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24 391 Areas of Agreement; Acupuncture demonstrates a small benefit compared with sham
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26 392 acupuncture.

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28 393 Areas of Controversy; NICE conclusively do not recommend the use of acupuncture for
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30 394 lower limb OA due to its lack of added benefit compared to the sham intervention.
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32 395 Inconsistencies in recommendations are likely due to the consideration of most appropriate
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34 396 comparator. Some experts in the field have questioned the decision to compare to sham
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36 397 findings, stating that decisions were 'based on a desire to avoid ethical problems in
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38 398 promoting therapies whose effects may derive largely from placebo' (33).

39
40 399 Growing Points; The reported similarity in benefits of acupuncture compared to the sham
41
42 400 intervention raise the question of the impact of placebo effect. Authors are questioning
43
44 401 whether we should use placebo for our advantage in treating OA (34)

45
46 402 Areas for further research; Definitive high quality trials of acupuncture are required that
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48 403 consider the most appropriate intervention comparator and determine the level of clinically
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50 404 meaningful difference.

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3 408 **Therapeutic Ultrasound**

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5 409 Areas of Agreement; At present there is no evidence to support the use of therapeutic
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7 410 ultrasound in hip OA, but there is limited evidence to suggest that there may be benefits in
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9 411 knee OA.

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11 412 Areas of Controversy; NICE do not include any recommendation regarding therapeutic
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13 413 ultrasound within their guidelines, yet this is a standard intervention available to
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15 414 physiotherapists.

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18 415 Growing Points: An updated Cochrane review suggested TUS may be beneficial for people
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20 416 with knee OA. The authors report that in contrast to their original review, four further
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22 417 studies were identified, although methodological quality of the studies was judged as poor.
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24 418 For pain outcomes, the benefits of ultrasound corresponded to a difference in pain scores of
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26 419 -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
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28 420 standardised WOMAC disability scale ranging from 0 to 10 (95% CI -3.0 to 0.3). A recent
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30 421 study not included within the Cochrane review suggested that TUS did not provide any
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32 422 additional benefit to exercise in improving pain and function (35)

33 423 Areas for further research; High quality studies are required to provide definitive evidence
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35 424 of the clinical benefits of TUS for people with knee and hip OA.

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42 427 **CONCLUSION**

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45 428 Physiotherapy management for OA consists of a variety of interventions. Whilst there is
46
47 429 strong evidence for the therapeutic benefits of exercise, there are fewer high quality studies
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49 430 demonstrating the benefits of other modalities. Given the growing numbers of people
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51 431 affected by OA and the limited availability of healthcare resources, there is a strong
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53 432 argument to suggest that practitioners focus on educating patients about the benefits of
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55 433 exercise, and facilitating continued exercise participation in people with OA.

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435 **REFERENCES**

- 436 1. Chen A, Gupte C, Akhtar K et al. The Global Economic Cost of Osteoarthritis: How the
437 UK Compares. *Arthritis* 2012; 2012 doi:10.1155/2012/698709
- 438 2. Arthritis Research UK. Osteoarthritis in General Practice: Data and perspectives.
439 2013
- 440 3. Litwic A, Edwards M, Dennison E, Cooper C. Epidemiology and Burden of
441 Osteoarthritis. *British Medical Bulletin* 2013, 105: 185–199.
- 442 4. Yu D, Peat G, Bedson J, Jordan KP. Annual consultation incidence of osteoarthritis
443 estimated from population-based health care data in England. *Rheumatology*
444 2015;54:20512060 doi:10.1093/rheumatology/kev231
- 445 5. Hagen KB, Smedslund G, Osteras N, Jamtvedt G. Quality of Community-Based
446 Osteoarthritis Care: A Systematic Review and Meta-Analysis. *Arthritis Care &*
447 *Research* 2016; 68; 1443–1452
- 448 6. Poitras S, Rossignol M, Avouac J et al. Management recommendations for knee
449 osteoarthritis: how usable are they? *Joint Bone Spine* 2010;77:45865.
- 450 7. Conrozier T, Marre JP, Payen-Champenois C et al. National survey on the non-
451 pharmacological modalities prescribed by French general practitioners in the
452 treatment of lower limb (knee and hip) osteoarthritis. Adherence to the EULAR
453 recommendations and factors influencing adherence. *Clin Exp Rheumatol* 2008;26:
454 7938.
- 455 8. Sarzi-Puttini P, Cimmino MA, Scarpa R et al. Do physicians treat symptomatic
456 osteoarthritis patients properly? Results of the AMICA experience. *Semin Arthritis*
457 *Rheum* 2005;35:3842.
- 458 9. National Institute of Health and Clinical Excellence. Osteoarthritis: care and
459 management. 2017; CG177
- 460 10. Zhang W, Nuki G, Moskowitz RW, et al. OARSI recommendations for the
461 management of hip and knee osteoarthritis: part III: Changes in evidence following
462 systematic cumulative update of research published through January 2009.
463 *Osteoarthritis and Cartilage* 2010; 18: 476-99.
- 464 11. Fernandes L, Hagen KB, Bijlsma JWJ. EULAR recommendations for the non-
465 pharmacological management of hip and knee osteoarthritis. *Annals of the*
466 *Rheumatic Diseases* 2013 doi:10.1136/annrheumdis-2012-202745
- 467 12. Hochberg M, Altman RD, April KT et al. American College of Rheumatology 2012
468 recommendations for the use of nonpharmacologic and pharmacologic therapies in
469 osteoarthritis of the hand, hip, and knee. *Arthritis Care and Research* 2012; 64: 465-
470 74
- 471 13. RACGP. Guideline for the non-surgical management of hip and knee osteoarthritis.
472 2009

Physio for OA

- 1
2
3 473 14. Uthman OA, van der Windt D, Jordan J, Dziedzic KS, Healey EL, Peat GM, Foster NE.
4 474 Exercise for lower limb osteoarthritis: systematic review incorporating trial
5 475 sequential analysis and network meta-analysis. *BMJ* 2013;347:f5555.
- 7 476 15. Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S. Exercise for
8 477 osteoarthritis of the hip. *Cochrane Database of Systematic Reviews* 2014, Issue 4.
9 478 Art. No.: CD007912. DOI: 10.1002/14651858.CD007912.pub2.Jordan et al (2010)
- 11 479 16. Loew L, Brosseau L, Wells GA, Tugwell P, Kenny GP, Reid R, et al, and the Ottawa
12 480 Panel. Ottawa Panel Evidence-Based Clinical Practice Guidelines for Aerobic Walking
13 481 Programs in the Management of Osteoarthritis. *Arch Phys Med Rehabil* 2012; 93:
14 482 1269-85.
- 16 483 17. Juhl C, Christensen R, Roos EM et al. Impact of exercise type and dose on pain and
17 484 disability in knee osteoarthritis: a systematic review and meta-regression analysis of
18 485 randomized controlled trials. *Arthritis Rheumatol.* 2014 Mar;66(3):622-36. doi:
19 486 10.1002/art.38290
- 21 487 18. Regnaud JP, Lefevre-Colau MM, Trinquart L, Nguyen C, Boutron I, Brosseau L, Ravaud
22 488 P. High-intensity versus low-intensity physical activity or exercise in people with hip
23 489 or knee osteoarthritis. *Cochrane Database of Systematic Reviews* 2015, Issue 10. Art.
24 490 No.: CD010203. DOI: 10.1002/14651858.CD010203.pub2.
- 26 491 19. Kroon FP, van der Burg LR, Buchbinder R et al. Self-management education
27 492 programmes for osteoarthritis. *Cochrane Database Syst Rev.* 2014 Jan
28 493 15;(1):CD008963. doi: 10.1002/14651858.CD008963.pub2.
- 30 494 20. Brand E, Nyland J, Henzman C, McGinnis, M. Arthritis self-efficacy scale scores in
31 495 knee osteoarthritis: a systematic review and meta-analysis comparing arthritis self-
32 496 management education with or without exercise. *Journal of Orthopaedic & Sports*
33 497 *Physical Therapy*, 2013 43(12), pp.895-910.
- 35 498 21. Lorig K, Chastain R, Ung E et al. Development and evaluation of a scale to measure
36 499 the perceived self-efficacy of people with arthritis. *Arthritis and Rheumatism*, 1989
37 500 32(1), 37-44.
- 39 501 22. Carnes D, Homer KE, Miles CL et al. Effective delivery styles and content for self-
40 502 management interventions for chronic musculoskeletal pain: a systematic literature
41 503 review. *The Clinical Journal of Pain* 2012 28(4), pp.344-354.
- 43 504 23. French HP, Brennan A, White B, Cusack T. Manual therapy for osteoarthritis of the
44 505 hip or knee: a systematic review. *Manual Therapy* 2011; 16(2): 109-117
- 46 506 24. Manheimer E, Cheng K, Linde K et al. Acupuncture for peripheral joint osteoarthritis.
47 507 *Cochrane Database of Systematic Reviews* 2010. 2010, Issue 1. Art. No.: CD001977. DOI:
48 508 10.1002/14651858.CD001977.pub2.
- 50 509 25. Manyanga T, Froese M, Zarychanski R. Pain management with acupuncture in
51 510 osteoarthritis: a systematic review and meta-analysis. *BMC Complementary and*
52 511 *Alternative Medicine* 2014 Aug 23;14:312. doi: 10.1186/1472-6882-14-312.

Physio for OA

- 1
2
3 512 26. Rutjes AW, Nüesch E, Sterchi R, Jüni P. Therapeutic ultrasound for osteoarthritis of
4 513 the knee or hip. *Cochrane Database Syst Rev.* 2010 Jan 20;(1):CD003132. doi:
5 514 10.1002/14651858.CD003132.pub2.
6
7 515 27. Jordan JL, Holden MA, Mason EEJ, Foster NE. Interventions to improve adherence to
8 516 exercise for chronic musculoskeletal pain in adults. *Cochrane Database of Systematic*
9 517 *Reviews* 2010, Issue 1. Art. No.: CD005956. DOI: 10.1002/14651858.CD005956.pub2.
10 518 28. Walsh N, Jordan JL, Babatunde OO, Powell J, Healey EL. Community based exercise
11 519 programmes led by non-healthcare exercise professionals for osteoarthritis
12 520 [Protocol]. *Cochrane Database of Systematic Reviews* 2016, Issue 4. Art. No.:
13 521 CD012166. DOI: 10.1002/14651858.CD012166.
14 522 29. Michie S, Richardson M, Johnston M et al. The behavior change technique taxonomy
15 523 (v1) of 93 hierarchically clustered techniques: building an international consensus for
16 524 the reporting of behavior change interventions. *Ann Behav Med.* 2013 Aug;46(1):81-
17 525 95. doi: 10.1007/s12160-013-9486-6.
18 526 30. French HP, Galvin R, Abbott JH, Fransen M. Adjunctive therapies in addition to land-
19 527 based exercise therapy for osteoarthritis of the hip or knee. *Cochrane Database of*
20 528 *Systematic Reviews* 2015, Issue 10. Art. No.: CD011915. DOI:
21 529 10.1002/14651858.CD011915.
22 530 31. Abbott JH, Robertson MC, Chapple C. Manual therapy, exercise therapy, or both, in
23 531 addition to usual care, for osteoarthritis of the hip or knee: a randomized controlled
24 532 trial. 1: clinical effectiveness. *Osteoarthritis Cartilage.* 2013 Apr;21(4):525-34. doi:
25 533 10.1016/j.joca.2012.12.014. Epub 2013 Jan 8.
26 534 32. French HP, Cusack T, Brennan A et al. Exercise and Manual Physiotherapy Arthritis
27 535 Research Trial (EMPART) for Osteoarthritis of the Hip: A Multicenter Randomized
28 536 Controlled Trial. *Archives of Physical Medicine and Rehabilitation* 2013;94:302-14
29 537 33. Bovey M. Acupuncture for osteoarthritis in the UK: A turning point for NICE?
30 538 *European Journal of Integrative Medicine* Volume 8, Issue 4, August 2016, Pages
31 539 337–341.
32 540 34. de Campos GC. Placebo effect in osteoarthritis: Why not use it to our advantage?
33 541 *World J Orthop.* 2015 Jun 18; 6(5): 416–420.
34 542 35. Cakir S, Hepguler S, Ozturk C, et al. Efficacy of therapeutic ultrasound for the
35 543 management of knee osteoarthritis: a randomized, controlled, and double-blind
36 544 study. *Am J Phys Med Rehabil.* 2014 May;93(5):405-12.
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Table 1 Physiotherapy intervention recommendations from NICE, OARSI and EULAR

MODALITY	NICE (9)	OARSI (10)	EULAR (11)
Exercise	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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, OARS and EULAR

Manual Therapy	<ul style="list-style-type: none"> • Manipulation and stretching should be considered as an adjunct to core treatments, particularly for osteoarthritis of the hip 	<ul style="list-style-type: none"> • Manual therapy was not included in these guidelines due to insufficient available evidence 	<ul style="list-style-type: none"> • Not included
TENS	<ul style="list-style-type: none"> • Healthcare professionals should consider the use of transcutaneous electrical nerve stimulation as an adjunct to core treatments for pain relief 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Not included
Acupuncture	<ul style="list-style-type: none"> • Do not offer acupuncture for the management of osteoarthritis 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Not included
Therapeutic Ultrasound	<ul style="list-style-type: none"> • Not included 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • Not included