Physical therapy interventions for knee pain secondary to osteoarthritis: a systematic review

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CRD summary
This review concluded there was low-strength evidence that aerobic, aquatic, strengthening, and proprioception exercise improved knee osteoarthritis outcomes. The risk of bias in studies, and variation in populations and interventions, downgraded the strength of most evidence to low or moderate. The authors’ conclusions were suitably cautious in reflecting the limited evidence available, and are likely to be reliable.

Authors' objectives
To evaluate the efficacy and comparative effectiveness of available physical therapy interventions for adults with knee osteoarthritis.

Searching
MEDLINE, The Cochrane Library, PEDro, AMED, HaPI, ClinicalTrials.gov, and the Internet, using Scirus, were searched for studies in English from 1970 to February 2012. Search strategies were reported. Reference lists of systematic reviews and included studies were searched.

Study selection
Randomised controlled trials (RCTs) recruiting community-dwelling adults with knee osteoarthritis were eligible if pain was an inclusion criterion or outcome. Many interventions were eligible, in the following areas: education, aerobic exercise, muscle-strengthening exercise, self-management, manual therapy, devices, electrotherapeutic interventions, heating or cooling therapies, and ultrasound. Eligible comparators were another physical therapy intervention, sham stimulation, usual care, and no active treatment. Eligible outcomes were knee pain, disability, quality of life, perceived health status, global assessments of treatment effectiveness, gait function, strength, transfers, joint function, and a composite measure of functional performance. Trials of physical therapy delivered in rehabilitation programmes for patients who had knee arthroplasty within the six months before the study, were excluded. Non-randomised clinical trials, case series, and observational cohort or case-control studies were included only for the assessment of adverse events.

More than 70% of the included participants were women. Most participants were overweight; the mean body mass index was around 29kg per m². Anti-inflammatory or pain relieving drugs were used in around half the trials. Most trials did not report the duration of osteoarthritis.

Two reviewers selected studies for inclusion, with disagreements resolved by discussion.

Assessment of study quality
Trial quality was assessed using the Cochrane risk of bias tool. Trials were classed as having medium risk of bias if at least one criterion was not met and a high risk of bias if two or more criteria were not met; details of blinding were noted, but were not used to assess risk of bias. The strength of evidence was assessed, using guidelines from the Evidence-based Practice Center Program at the Agency for Healthcare Research and Quality, and it was assessed for each major outcome, using Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria.

The authors did not state how many reviewers assessed quality.

Data extraction
Data were extracted to calculate mean differences or relative risks with 95% confidence intervals. One reviewer extracted the data, which were then checked by a second reviewer. Disagreements were resolved by discussion.

Methods of synthesis
Where the definitions of interventions and outcomes were the same, meta-analyses were performed to calculate pooled relative risks and standardised mean differences with 95% confidence intervals, using a random-effects model.
Standardised mean differences were then transformed back to the original scale (back-transformed), using pooled standard deviations from large population-based studies, to give difference estimates for the European Quality of life (EQ-5D) questionnaire, Short Form (SF-36) Health Survey, visual analogue scale (VAS), Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index physical function score, and walking speed. Heterogeneity was assessed using I² and X². Several meta-regression and subgroup analyses were pre-specified.

Results of the review
One hundred and ninety-three RCTs were included and 84 had data suitable for meta-analysis. Most trials (138) had adequate randomisation. The adequacy of allocation concealment was unclear in 129 trials. There was no plan to use intention-to-treat analysis in 118 trials and the mean attrition rate was 10.3%. An open-label design with no blinding of outcome assessment was used in 68 trials. Most trials (107) had a medium risk of bias and most reported the effects at three months or before.

Results from over 80 different meta-analyses were reported. They indicated that there was low-strength evidence that aerobic exercise and aquatic exercise improved disability and that aerobic exercise, strengthening exercise, and ultrasonography reduced pain and improved function. Six of 11 trials demonstrated clinically important improvements in pain and disability with aerobic exercise. Other interventions demonstrated no sustained benefit. Moderate-strength evidence suggested that high adherence for both aerobic and strengthening exercise was associated with better outcomes.

In low-strength-of-evidence comparative trials, there were no statistically significant differences between the different types of exercise, between exercise and electrical stimulation, or between different types of insole (all analyses were of two RCTs).

Adverse events were uncommon and did not deter participants from continuing treatment.

Authors’ conclusions
Low-strength evidence suggested that core physical therapy interventions, including aerobic, aquatic, strengthening, and proprioception exercise, improved patient outcomes. The risk of bias in studies and variation in populations and physical therapy interventions downgraded the strength of evidence to low or moderate in most cases.

CRD commentary
The review addressed a clear question and was supported by detailed eligibility criteria. Attempts were made to identify studies primarily by searching several relevant databases, but the restriction to trials in English meant that some might have been missed. Suitable methods were employed to reduce the risks of reviewer error and bias during the review, but the number of reviewers who assessed quality was not reported. Trial quality was assessed and was used in evaluating the strength of the evidence. The trial details were provided in a full report (see Other Publications of Related Interest), but it was often difficult to tell what the comparison groups received in each trial. Appropriate methods were used to pool the data and to assess heterogeneity and the sources of heterogeneity were explored in the full report.

The authors’ conclusions were suitably cautious in reflecting the limited evidence available, and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that therapeutic exercise programmes should focus on increasing adherence rather than increasing the amount or intensity of exercise.

Research: The authors stated that a consensus was needed on the methods used to judge the benefits of physical therapy interventions. These benefits should be defined as rates of clinically important improvements in pain, independence in daily activities, and quality of life. They reported a need for meta-analyses of individual patient data to better assess the clinical importance of the treatment effects. Fully powered trials should examine comprehensive and multimodal interventions that more closely resemble physical therapy in practice.

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