Effectiveness of physiotherapy exercise after knee arthroplasty for osteoarthritis: systematic review and meta-analysis of randomised controlled trials

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CRD summary
This review evaluated the effectiveness of physiotherapy exercise after elective total knee arthroplasty in patients with osteoarthritis. The authors concluded that interventions including physiotherapy functional exercises result in small to moderate short-term benefit but no long-term benefit. Although the review was generally well conducted, owing to the small number of trials and some methodological concerns about the synthesis, the extent to which the authors’ conclusions are reliable is unclear.

Authors’ objectives
To evaluate the effectiveness of physiotherapy exercise after elective primary total knee arthroplasty (TKA) in patients with osteoarthritis.

Searching
In March 2005 and April 2007 the following sources were searched for relevant studies: AMED (from 1985), CINAHL (from 1982), EMBASE (from 1974), King's Fund database (from 1979), MEDLINE (from 1966), the Cochrane Library, PEDro and the Department of Health's National Research Register; the search terms were reported. In addition, handsearches of the journals Physiotherapy and Physical Therapy (1985 to 2007), along with conference proceedings in the Journal of Bone and Joint Surgery (British volume) (1985 to 2006) and the reference lists of included studies, were also conducted to identify further relevant studies. No language restrictions were applied.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Studies of physiotherapy exercise interventions (out-patient sessions and functional programmes) conducted in the out-patient, community or home setting were eligible for inclusion. The intervention had to be compared with usual or standard physiotherapy care, or to another physiotherapy exercise intervention. Physiotherapy interventions that made use of electrical adjuncts were excluded.

Participants included in the review
Patients discharged from hospital after undergoing elective primary TKA for osteoarthritis were eligible for inclusion.

Outcomes assessed in the review
Studies that assessed scores of functional activities, walking measures, quality of life, muscle strength and range of motion in the knee joint were eligible for inclusion. Several outcome measures were used in the included studies: the Oxford knee score, the American Knee Society clinical rating score, the Western Ontario and McMaster Universities osteoarthritis index, the Bartlett patellar score (all measures of function), walking speed over a 10-metre distance, a walking test over a 50-metre walkway (all measures of walking), degrees (measure of range of motion), and SF-36 and SF-12 scores (measures of quality of life). None of the studies directly measured muscle strength.

How were decisions on the relevance of primary studies made?
Two reviewers assessed eligibility and agreed on the relevance of the studies.

Assessment of study quality
Established validity criteria based on the NHS Critical Appraisal Skills Programme (CASP) and the Consolidated Standards of Reporting Trials (CONSORT) statement were used. Two reviewers independently performed the validity assessment and resolved any disagreements through discussion.

**Data extraction**

The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Authors were contacted for further information where necessary.

**Methods of synthesis**

How were the studies combined?
The studies were combined in a narrative and in meta-analyses. In the meta-analyses of weighted mean differences (for range of joint motion and quality of life) and standardised effect sizes (for measures of function, walking and quality of life), fixed-effect models were used and 95% confidence intervals (CIs) were reported. An assessment of publication bias was not considered necessary because of the small number of included trials.

How were differences between studies investigated?
Statistical heterogeneity was measured using chi-squared and I-squared tests for the results of the following outcomes: function, walking, joint range of motion and quality of life. The tests were performed 3 to 4 months and 12 months after surgery.

**Results of the review**

Six RCTs (n=614) were included in the review. One study (n=60) was not considered suitable for meta-analysis.

The overall trial quality was rated good.

**Measures of function.**

At 3 to 4 months after surgery the pooled standardised effect size was 0.33 (95% CI: 0.07, 0.58; 3 trials), suggesting a statistically significant, small to moderate effect in favour of the physiotherapy intervention. The pooled standardised effect size after 12 months was -0.07 (95% CI: -0.28, 0.14; 4 trials).

**Walking (3 trials).**

At 3 to 4 months after surgery the pooled standardised effect size was 0.27 (95% CI: -0.13, 0.67). The pooled standardised effect size after 12 months was 0.03 (95% CI: -0.24, 0.31).

**Range of joint motion (4 trials).**

At 3 to 4 months after surgery the pooled weighted mean difference was 2.90 degrees (95% CI: 0.61, 5.20), suggesting a statistically significant, small to moderate effect in favour of the physiotherapy intervention. The pooled weighted mean difference after 12 months was 0.96 degrees (95% CI: -1.10, 3.00).

**Quality of life.**

At 3 to 4 months after surgery the pooled weighted mean difference in score was 1.70 (95% CI: -1.0, 4.3; 2 trials), suggesting a small effect in favour of the physiotherapy intervention. The pooled standardised effect size after 12 months was 0.03 (95% CI: -0.20, 0.25; 3 trials).

No statistical heterogeneity in the results was found by either the chi-squared or I-squared tests.
Authors' conclusions
Interventions that include physiotherapy functional exercises after discharge from hospital result in a short-term benefit after primary TKA. The effect sizes were small to moderate, with no long-term benefit.

CRD commentary
The review addressed a clearly defined research question and this was supported by detailed inclusion criteria. Several relevant sources were searched for studies in any language and attempts were made to locate unpublished studies, thus limiting the potential for language and publication biases. Adequate steps were taken to minimise error and bias in the review process, although it was unclear how the full data extraction of the studies was carried out. The validity of the included studies was adequately assessed and reported.

Details of the included studies were presented; however, more information about the participants in the included studies would have been desirable. The studies were combined in meta-analyses using fixed-effect models. These assume that the included studies all measure the same underlying treatment effect. Although no statistical heterogeneity was found, the implied clinical heterogeneity arising from different exercise interventions and outcome measures suggests that a random-effects model might have been more appropriate. The review was otherwise well conducted and the authors' conclusions reflect the evidence presented. However, in view of methodological concerns about the synthesis, and the fact that this was based on a few trials with small sample sizes, the extent to which these conclusions are reliable is unclear.

Implications of the review for practice and research
Practice: The authors stated that it seems reasonable to refer patients undergoing knee arthroplasty for a short course of physiotherapy after discharge from hospital to provide short-term benefit. In these short-term courses, exercises based on functional activities may be more effective than isometric muscle exercises or exercises to increase range of motion in the joint.

Research: The authors did not state any implications for further research.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.