

traumatic brain injury as a consequence of amateur boxing is not strong.

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

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### ABSTRACT

**Objective** To evaluate the effectiveness of physiotherapy exercise after elective primary total knee arthroplasty in patients with osteoarthritis.

**Design** Systematic review.

**Data sources** Database searches: AMED, CINAHL, Embase, King's Fund, Medline, Cochrane library (Cochrane reviews, Cochrane central register of controlled trials, DARE), PEDro, Department of Health national research register. Hand searches: *Physiotherapy*, *Physical Therapy*, *Journal of Bone and Joint Surgery (Britain)* *Conference Proceedings*.

**Review methods** Randomised controlled trials were reviewed if they included a physiotherapy exercise intervention compared with usual or standard physiotherapy care, or compared two types of exercise physiotherapy interventions meeting the review criteria, after discharge from hospital after elective primary total knee arthroplasty for osteoarthritis.

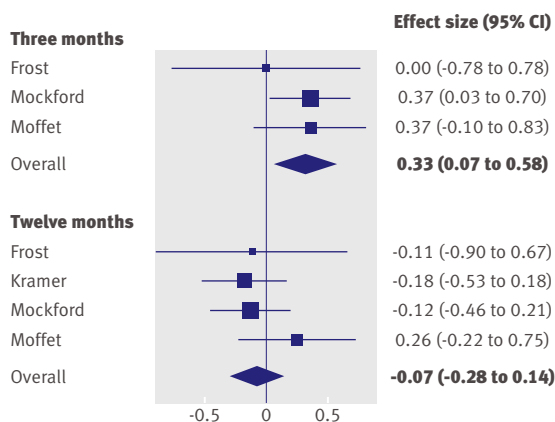
**Outcome measures** Functional activities of daily living, walking, quality of life, muscle strength, and range of motion in the knee joint. Trial quality was extensively evaluated. Narrative synthesis plus meta-analyses with fixed effect models, weighted mean differences, standardised effect sizes, and tests for heterogeneity.

**Results** Six trials were identified, five of which were suitable for inclusion in meta-analyses. There was a small to moderate standardised effect size (0.33, 95% confidence interval 0.07 to 0.58) in favour of functional exercise for function three to four months postoperatively. There were also small to moderate weighted mean differences of 2.9 (0.61 to 5.2) for range of joint motion and 1.66 (-1 to 4.3) for quality of life in favour of functional exercise three to four months postoperatively. Benefits of treatment were no longer evident at one year.

**Conclusions** Interventions including physiotherapy functional exercises after discharge result in short term benefit after elective primary total knee arthroplasty. Effect sizes are small to moderate, with no long term benefit.

### INTRODUCTION

The length of hospital stay after joint arthroplasty surgery has markedly and rapidly decreased.<sup>1</sup> Given that patients who undergo knee arthroplasty may still experience considerable functional impairment postoperatively,<sup>2</sup> the effectiveness of physiotherapy after discharge is a valid question. We systematically reviewed randomised controlled trials to determine the effectiveness of physiotherapy exercise after discharge in terms of improving function, quality of life, walking,



**Fig 1** | Forest plot of standardised effect sizes with confidence intervals for function and results of test for heterogeneity

range of motion in the knee joint, and muscle strength for patients with osteoarthritis after elective primary unilateral total knee arthroplasty.

## METHODS

### Searching

In March 2005 and April 2007 we identified randomised controlled trials by simultaneously searching AMED, CINAHL, Embase, King's Fund database, and Medline via Knowledge Access 24/7 (KA24). We also searched the Cochrane library, PEDro physiotherapy evidence database, and the Department of Health national research register. In July 2005 and April 2007 we handsearched *Physiotherapy* and *Physical Therapy* to double check for trials. The conference proceedings in the *Journal of Bone and Joint Surgery (Britain)* were also handsearched, as were the reference lists of included trials. As it is difficult to locate physiotherapy trials, we used multiple general searches.

### Selection

We sought randomised controlled trials of patients undergoing elective total knee arthroplasty for osteoarthritis who received an intervention of physiotherapy exercise after discharge from hospital. We used broad definitions of "physiotherapy" and "exercise" to include any exercises or exercise programme advised or provided by physiotherapists or physical therapists during the rehabilitative period after discharge from hospital in the outpatient, community, or home setting. We excluded trials in which the intervention consisted of an electrical adjunct to physiotherapy. Physiotherapy exercise interventions included outpatient physiotherapy sessions and functional physiotherapy programmes, in which exercises are based on functional activities. Trials were included if they investigated a physiotherapy intervention compared with usual or standard care or compared two different types of relevant physiotherapy intervention. Usual or standard care refers to the continuation of home exercise programmes provided to patients during a stay in

hospital. These usually consist of isometric or simple strengthening exercises, exercises to regain range of movement, and stretches. Effectiveness outcomes were measures of functional activities of daily living, walking, self reported measures of quality of life, muscle strength, and range of motion in the knee joint.

### Validity assessment, data abstraction, and quality assessment

We developed and piloted a data extraction form using quality indicators. See [bmj.com](http://bmj.com). Similar analysis of individual quality components has previously been used in reviews of physiotherapy.<sup>3</sup> Two reviewers independently extracted the data. The level of agreement between reviewers was 69.09% ( $\kappa$  0.524, intraclass correlation coefficient (2,1) 0.49, 95% confidence interval 0.30 to 0.63). A third reviewer was available in the event of consensus not being reached, but this was not required. If necessary, we contacted authors for further information.

### Quantitative data synthesis

We carried out meta-analyses for knee function, walking, range of joint motion, and quality of life. The time points used to note outcome scores were three to four months after surgery and 12 months after surgery. If the same measure was reported we used weighted mean differences, otherwise we used standardised effect sizes (small (0.2), medium (0.5), and large (0.8)). We use fixed effect models and 95% confidence intervals throughout and performed tests of heterogeneity ( $\chi^2$ ). We also calculated  $I^2$  to give a measurement of the degree of heterogeneity.

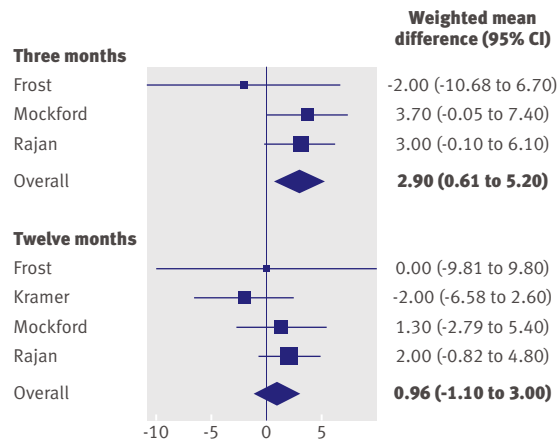
## RESULTS

We identified and screened 27 potentially relevant studies. Of these, six studies<sup>w1-w6</sup> were included in the systematic review and five<sup>w2-w6</sup> in the meta-analysis. See [bmj.com](http://bmj.com) for details.

### Summary of the interventions and comparisons

With the exception of one trial,<sup>w6</sup> in-depth details of the intervention and comparison groups were available. The trial interventions were similar to each other; they provided additional physiotherapy exercises or treatment after discharge after total knee arthroplasty. Though most interventions included functional weight bearing exercises, one investigated the effect of eccentric isokinetic muscle strengthening with a CYBEX dynamometer.<sup>w1</sup> Interventions usually started within two weeks of discharge. Outpatient programmes generally lasted up to 12 weeks, while home exercise programmes were recommended for up to a year or indefinitely in one case.<sup>w3</sup>

The comparison groups were mainly control groups in which no additional outpatient physiotherapy was organised. Patients were expected to continue with the traditional home exercise programme—namely, isometric strengthening and range of movement exercises plus gait training or re-education provided to all patients during their stay in hospital.



**Fig 2** | Forest plot of weighted mean differences with confidence intervals for range of motion (in degrees)

### Quantitative data synthesis

**Measures of function (five trials)**—Five of the studies contained a measure of function.<sup>w1-w5</sup> The measures used included the Oxford knee score<sup>w4</sup>; the American Knee Society clinical rating score<sup>w1 w3 w4</sup>; the Western Ontario and McMaster Universities osteoarthritis index (WOMAC)<sup>w3 w5</sup>; and the Bartlett patellar score.<sup>w4</sup> Within the individual trials, three found no significant differences between groups.<sup>w1-w3</sup> One found significant differences within groups for the treatment arm, indicating a benefit of treatment.<sup>w2</sup> Another found significant differences between the two groups, in favour of the intervention, at four and six months but not at 12 months.<sup>w5</sup> Figure 1 shows the three studies with data on functioning at three to four months and 12 months after surgery. Where studies included more than one measure of function we used the Oxford knee and the WOMAC scores. No trial included both these scores. At three to four months the standardised effect size was small to moderate. At 12 months, with one additional study, the effect size was close to zero.

**Walking (three trials)**—Three trials used some form of outcome measure for walking.<sup>w2 w3 w5</sup> One trial found no significant differences between groups,<sup>w3</sup> another found differences approaching significance,<sup>w5</sup> and the third trial found significant differences within interventions groups.<sup>w2</sup> The intervention had no overall influence on walking at either three or 12 months.

**Range of joint motion (five trials)**—Five trials used the range of motion in the knee joint as an outcome measure.<sup>w1-w4 w6</sup> Although all measurements were provided in degrees, the method of achieving results varied. The results were mixed (see bmj.com). Figure 2 shows the weighted mean differences and confidence intervals. The three month summary shows an increase of 2.9° (0.61° to 5.2°), which is considered small to moderate. At 12 months the effect was smaller, about 1° (-1.10° to 3.00°).

**Quality of life (three trials)**—Three trials included measures of quality of life.<sup>w3-w5</sup> One trial found no significant differences between the groups.<sup>w3</sup> Another

trial has not yet presented statistical analyses for this measure.<sup>w4</sup> The final trial found small significant differences in favour of the intervention group at six month follow-up but not at 12 month follow-up.<sup>w5</sup> At three to four months the studies used the same measure, the SF-12. The weighted mean difference was 1.7 (-1.0 to 4.3), indicating a small effect in favour of the intervention. At 12 months the effect was close to zero with a standardised effect size of 0.03 (-0.20 to 0.25).

### DISCUSSION

This systematic review provides support for the use of physiotherapy exercise interventions using exercises based on functional activities after discharge, rather than traditional home exercise and advice programmes, to obtain short term benefit after elective primary knee arthroplasty. There was a small to moderate standardised effect size in favour of functional exercise for function three to four months postoperatively. Small to moderate weighted mean differences, in favour of functional exercise interventions, were seen for range of joint motion and quality of life three to four months postoperatively. Any benefits seen after treatment did not persist to one year follow-up.

### Strengths and weaknesses of review procedures

Physiotherapy literature remains a difficult area to search, with numerous bibliographic databases and unindexed journals.<sup>4</sup> We believe that this review remains the most comprehensive to date.

Trial quality was good overall. Like most physiotherapy trials,<sup>5</sup> studies were relatively small with 554 participants in the five trials included in the meta-analyses and 614 participants included overall in the review. The most commonly used outcomes were function, predominantly subjective measures of functional ability, and range of joint motion as an objective measure. While range of joint motion is important, its usefulness as an outcome measure is limited as other factors, such as prosthetic design, preoperative knee motion, and surgical technique, also influence it.<sup>6</sup> None of the trials directly measured muscle strength. Instead studies used objective measures like walking.

There were no apparent problems with our data extraction processes. Although many quality checklists and scales exist, there is no accepted ideal score; component approaches are often preferred. The  $\chi^2$  tests did not indicate major problems with heterogeneity but were limited by low power. The  $I^2$  results also indicated no observed heterogeneity. The number of available studies, and their size, does limit this review. It is perhaps surprising that so few published trials exist for such a common practice. This may be partially attributable to the general lack of research on rehabilitation in orthopaedic surgery patients after discharge.

### Clinical implications

Presently, given the reduction in length of hospital stay, compressed inpatient rehabilitation, and the limitations of the available evidence, it seems reasonable to refer patients for a short course of physiotherapy after

**WHAT IS ALREADY KNOWN ON THIS TOPIC**

Osteoarthritis is the commonest cause of disability in older people, and total knee joint arthroplasty is a common orthopaedic procedure

Uncertainty exists regarding whether physiotherapy after discharge should be routinely provided to patients after elective primary knee arthroplasty for osteoarthritis

**WHAT THIS STUDY ADDS**

Functional physiotherapy exercise soon after discharge results in short term benefit after elective primary knee arthroplasty

No benefit was seen at one year

discharge. In the short term physiotherapy exercise interventions with exercises based on functional activities may be more effective after total knee arthroplasty than traditional exercise programmes.

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## Effect of prolonged and exclusive breast feeding on risk of allergy and asthma: cluster randomised trial

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**ABSTRACT**

**Objective** To assess whether exclusive and prolonged breast feeding reduces the risk of childhood asthma and allergy by age 6.5 years.

**Design** Cluster randomised trial.

**Setting** 31 Belarussian maternity hospitals and their affiliated polyclinics.

**Participants** A total of 17 046 mother-infant pairs were enrolled, of whom 13 889 (81.5%) were followed up at age 6.5 years.

**Intervention** Breastfeeding promotion intervention modelled on the WHO/UNICEF baby friendly hospital initiative.

**Main outcome measures** International study of asthma and allergies in childhood (ISAAC) questionnaire and skin prick tests of five inhalant antigens.

**Results** The experimental intervention led to a large increase in exclusive breast feeding at 3 months (44.3% v 6.4%; P<0.001) and a significantly higher prevalence of any breast feeding at all ages up to and including 12 months. The experimental group had no reduction in risks of allergic symptoms and diagnoses or positive skin prick tests. In fact, after exclusion of six sites (three experimental and three control) with suspiciously high rates of positive skin prick tests, risks were significantly increased in the experimental group for four of the five antigens.

**Conclusions** These results do not support a protective effect of prolonged and exclusive breast feeding on asthma or allergy.

**Trial registration** Current Controlled Trials ISRCTN37687716.

**INTRODUCTION**

Research findings indicating a beneficial effect of breast feeding on the development of allergy have been most consistent for atopic eczema during infancy, but the evidence on asthma and other atopic outcomes is mixed. Some studies have reported greater degrees of protection with more exclusive and prolonged breast feeding.<sup>1-4</sup> Other studies have reported no reduction in risk or even an increase in risk with breast feeding.<sup>5-12</sup>

Virtually all of the evidence is based on observational studies. Case-control studies are prone to recall bias. Cohort studies are prone to biased assessment of outcomes when observers are not blinded to the previous infant feeding history. Misclassification of infant feeding history is always a problem in studying the health effects of breast feeding but is even more problematic in studies of atopic disease, in which hypersensitivity reactions and atopic disease may not show dose-response effects and may be affected by the frequency and timing of breast feeding.

One solution to these methodological problems is a randomised controlled trial. Although randomising