Continuous passive motion following total knee arthroplasty (Review)

Milne S, Brosseau L, Welch V, Noel MJ, Davis J, Drouin H, Wells GA, Tugwell P

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[Intervention Review]

Continuous passive motion following total knee arthroplasty

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ABSTRACT

Background

Knee arthroplasty (KA) is a common intervention that can enhance the quality of life for patients with osteoarthritis (OA) and rheumatoid arthritis (RA). Post-surgery rehabilitation protocols often include continuous passive motion (CPM). However, CPM protocols vary considerably amongst institutions.

Objectives

The purpose of the current meta-analysis is to evaluate the effectiveness of continuous passive motion following total knee arthroplasty.

Search strategy

An electronic search of MEDLINE (1966 to 2002), EMBASE (1988 to 2002), CINAHL (1982 to 2002), HEALTH STAR (1991 to 1994) and CURRENT CONTENTS (1997 to 2002) was conducted to identify randomized controlled trials.

Selection criteria

Following an a priori protocol, only randomized controlled trials of CPM for the treatment of participants post KA were eligible. Subjects were 18 years of age or older and had a pre-surgery diagnosis of degenerative joint disease. Both the experimental and control groups received physiotherapy. In addition to the physiotherapy intervention, the experimental group received CPM.

Data collection and analysis

Two reviewers independently selected trials for inclusion. Data were then extracted and the quality of the trial assessed using predetermined forms. Outcome measures of interest were: active and passive knee range of motion (ROM) length of hospital stay, pain, swelling and quadriceps strength. A fixed effects model was used throughout for continuous variables, except where heterogeneity existed; in which case, a random effects model was used. Results were analyzed as weighted mean differences (WMD) with 95% confidence intervals (CI). Standardized mean differences (SMD) were used when different scales were used to measure the same concept (e.g. pain). Dichotomous outcomes were presented as a relative risk.

Main results

Fourteen trials were retained for analysis. Results favouring CPM were found for the main comparison of CPM combined with physiotherapy (PT) versus PT alone at end of treatment. For the primary outcomes of interest, CPM combined with PT was found to statistically significantly increase active knee flexion (WMD 4.30 degrees, 95% CI: 1.96, 6.63) and decrease length of stay (WMD -0.69 days, 95% CI: -1.35, -0.03). CPM was also found to decrease the need for post-operative manipulation (RR 0.12, 95% CI: 0.03, 0.53). CPM did not significantly improve passive knee flexion and passive or active knee extension.

Authors' conclusions

CPM combined with PT, may offer beneficial results compared to PT alone in the short term rehabilitation following total knee arthroplasty.

PLAIN LANGUAGE SUMMARY

Continuous passive motion following total knee arthroplasty

Continuous passive motion combined with physiotherapy offers beneficial results compared to physiotherapy alone in the short term rehabilitation following total knee arthroplasty.

Continuous passive motion is a commonly used device post knee arthroplasty. This review of 14 studies (952 participants) found significant improvements in active knee flexion and analgesic use two weeks post-operatively with the use of continuous passive motion and physiotherapy compared to physiotherapy alone. In addition, length of hospital stay and need for knee manipulations were significantly decreased in the continuous passive motion group. Continuous passive motion combined with physiotherapy may offer beneficial results for patients post knee arthroplasty. However, the potential benefits will need to be carefully weighed against the inconvenience and expense of CPM. More research is necessary in order to assess the differences in effectiveness with different characteristics of application such as total duration of treatment and intensity of CPM interventions.

BACKGROUND

Knee arthroplasties (KA) are surgical procedures which have become more common in the last few decades in part due to the aging population. Rheumatoid arthritis(RA) and osteoarthritis (OA) are the two main causes for knee arthroplasty. Over the years, clinical trials have proven that immobilization of a specific joint following surgery has detrimental effects on collagen tissue healing, articular cartilage nutrition and joint stiffness (McCarthy 1992) . Recent studies have demonstrated that early movement is beneficial for the recovery of range of motion (ROM) in an immobilized joint (Videman 1987). Continuous passive motion (CPM) is an external motorized device which enables a joint to move passively throughout a preset arc of motion (Sheppard 1995). CPM was first introduced by Salter in 1970 who initiated trials using rabbits. CPM has been shown to have positive effects on soft tissue healing, swelling, hemarthrosis and joint function (McCarthy 1992). In addition, several studies have claimed that the use of CPM can significantly increase the amount of knee flexion by the time of discharge from hospital (Fisher 1985, Schebel 1989). Other research has reported that CPM decreases the rate of manipulation under anesthesia post-KA (Fox 1981). However, a retrospective study comparing CPM and physiotherapy to physiotherapy alone found no significant difference in knee range of motion between the CPM and the non-CPM treatment groups (Nadler 1993). It has been suggested that the true efficacy of CPM is not known as clinicians are presently using the CPM device sub-optimally (Frank 1984). The mechanism of action, dose-responsiveness and specific tissue effects need to be clarified in order to use the CPM optimally. Coutts reported on the effectiveness of the CPM following knee arthroplasty. This study claimed to show that 20 hours of CPM daily increased ROM and decreased edema and effusion (Coutts 1984). Similarly, Davies reported increased ROM by using the CPM device 18 hours per day (Davis 1984). Young and Kroll investigated the effectiveness of the CPM following a three-day delay in the initiation of treatment. They concluded that the CPM did not offer additional benefits from conventional physiotherapy alone (Young 1984). Others like Strap & Woodfin only used the CPM for 6 hours during the day and obtained positive

results (Stap 1986). Despite controversial results, CPM is used by many surgeons as part of the standard postoperative management of patients with knee arthroplasty.

OBJECTIVES

The aim of this meta-analysis is to determine the effectiveness of CPM following knee arthroplasty. We will compare CPM to standard physiotherapy treatments done on patients after a total knee arthroplasty. Standard physiotherapy treatment consisted of any combination of the following interventions: range of motion (ROM) exercises, muscle strengthening exercises (isometric, dynamic), functional exercises, gait training, immobilization and ice. The outcome measures of interest for this meta-analysis were active and passive knee ROM, length of hospital stay, pain, knee swelling, fixed flexion deformity and quadriceps strength at end of treatment and during follow-up.

METHODS

Criteria for considering studies for this review

Types of studies

Only randomized controlled trials (RCT) were included in this meta-analysis. Articles had to be published in English or French. Abstracts were accepted. Studies were not excluded based on quality assessment.

Types of participants

Subjects were 18 years of age or older and were hospitalised following knee arthroplasty procedures. Pre-surgery diagnosis for all subjects was classified as degenerative joint disease, OA or RA.

Types of interventions

Both the experimental and control groups received physiotherapy intervention which consisted of any combination of the following interventions: range of motion (ROM) exercises, muscle strengthening exercises (isometric, dynamic), functional exercises, gait training, immobilization and ice. In addition to the physiotherapy intervention, the experimental group received CPM. Trials were excluded if CPM was combined with any of the following interventions: electrotherapy (ultrasound, interferential current, short wave diathermy, transcutaneous electrical nerve stimulation, neuromuscular electrical stimulation), hydrotherapy and heat.

Types of outcome measures

The primary outcomes of interest were: degrees of active knee ROM, degrees of passive knee ROM or presence of a fixed flexion deformity, and length of hospital stay measured in days(LOS). Pain, swelling and quadriceps strength were considered secondary outcomes. From each trial, data were collected at baseline, end of treatment and follow-up. Change from baseline to end of study was also extracted.

Search methods for identification of studies

An electronic search strategy was used to identify studies, details of this search are outlined in Appendix 1.
The following data bases were included: Medline (1966 to Sept. 2002), CINAHL (1982 to 2002), Embase (1988 to 2002), Health Star (1991 to 1994) and Current Contents (1997 to 2002). The electronic search was complemented with a search of the reference lists of the retained trials. Content experts were contacted for additional studies and unpublished data. If data could not be obtained, abstracts were excluded.

Data collection and analysis

Two independent reviewers (HD,JD) examined the titles and abstracts of the trials identified by the search strategy to select trials that met the inclusion criteria. All trials classified as relevant by at least one of the reviewers were retrieved. The retrieved articles were re-examined to ensure they met the inclusion criteria.
The results of the individual trials were extracted from each of the included trials using pre-determined extraction forms by two independent reviewers (HD, JD). The data were cross-checked by a third reviewer (LB). The extraction forms were developed and pilot-tested, based on other forms used by the Cochrane Musculoskeletal Review Group. Data of interest was grouped in either subject characteristics (age, gender, diagnosis, etc.) or CPM therapeutic application (hours /day, increments in degrees/day, etc.). The outcome measures collected were length of hospital stay, ROM (passive and active knee flexion and extension), extension lag, fixed flexion deformity, pain (VAS), pain medication intake, swelling of the knee and quadriceps strength. These outcomes were considered pertinent to physiotherapy intervention by three of the authors (HD, JD & MJN). The final data values were based on consensus of the two reviewers.
Quality assessment: The quality of the studies was assessed by two independent reviewers. Quality assessment examined the extent to which the RCT design, data collection and statistical analysis minimized or avoided biases in its treatment comparisons (Moher et al., 1995). A validated scale (Jadad 1996) was used to perform the quality assessment. The scale includes items pertaining to description of randomization, appropriateness of blinding, dropouts

and withdrawals and follow-up. Differences in scoring were resolved by consensus. A third reviewer (LB) was consulted when necessary. The quality assessment was pilot tested on 4 unrelated articles prior to data extraction.

Results were analyzed to compare CPM combined with PT versus PT alone. Results on individual treatment techniques were analysed separately. Data on the outcomes from each trial were pooled to arrive at an overall estimate of the effectiveness of the procedure. Where possible, the analyses were based on intention-to-treat data from the individual trials. In cases where trials reported outcomes as graphs, the mean scores and standard deviations were estimated from the graphs. Subgroup analyses were attempted to determine the effects of the method administration, methodological quality and the intervention duration on outcomes. For continuous data, results were presented as weighted mean differences (WMD), where the difference between the treated and control groups was weighted by the inverse of the variance. For dichotomous outcomes, results were presented as an Odds Ratio or Relative Risk (RR). Standardized mean differences (SMD) were used when different scales were used to measure the same concept (e.g. pain). SMDs were calculated by dividing the difference between treated and control means by the pooled estimate of the baseline standard deviation. Fixed effects models were used throughout, unless statistical heterogeneity was demonstrated by the Cochran's Q test ($p<.05$). Where heterogeneity was significant, random effects models were used. For outcomes where it is desirable to have a lower score (e.g. pain), a negative value indicates a positive effect of the intervention procedure. For outcomes where a larger value is desirable (e.g. range of motion), a positive value demonstrates benefits.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

The data base search identified 178 articles. Of the 178 articles, fifty-eight trials were screened for relevance and inclusion into this meta-analysis. Of the fifty-eight screened, fourteen were in accordance with the inclusion criteria (Chen 2000,Chiarello 1997b, Colwell 1992, Harms 1991, Johnson 1990, Kumar 1996, MacDonald 2000, May 1999, McInnes 1992, Montgomery 1996, Nielsen 1988, Pope 1997, Vince 1987, Walker 1991). For inclusion, subjects were 18 years of age or older and were hospitalised following knee arthroplasty procedures. Pre-surgery diagnosis for all subjects was classified as degenerative joint disease, OA or RA. The length of treatment in individual studies varied from 18 hours to 2 weeks. Daily CPM treatment time varied from 5 hours/ daily to 20 hours/daily. All fourteen articles included both male and female patients. A total of 952 patients were included for analysis. Trials were excluded for several reasons including: 1) no clinical outcomes of interest; 2) not a clinical trial; 3) subjects did not undergo knee arthroplasty; 4) no variance reported on outcomes. The primary diagnosis was degenerative joint disease. Osteoarthritis (OA) was present in over 89% of cases and rheumatoid arthritis represented in no more than 8% of the subject diagnoses.

Risk of bias in included studies

The median methodology quality was two out of a maximum of five points. The range of the quality scores were from one to three. Of the fourteen RCTs, three scored full points for randomization (Harms 1991, Kumar 1996, MacDonald 2000). No studies were described as double-blinded and three failed to provide a description of drop-outs (Chen 2000, Harms 1991, Johnson 1990). For the main comparison of CPM combined with PT versus PT alone, the median methodological quality was 2. Eight articles obtained a score of 2 (Chiarello 1997b, Colwell 1992, Harms 1991, McInnes 1992, Montgomery 1996, Nielsen 1988, Vince 1987, Walker 1991), while one obtained a score of 3 (Kumar 1996). Eight articles provided a description of withdrawals and drop-outs (Chiarello 1997b, Colwell 1992, Kumar 1996, McInnes 1992, Montgomery 1996, Nielsen 1988, Vince 1987, Walker 1991) while only 1 article received full points for randomization (Harms 1991).

Effects of interventions

Pooled Analysis

Pooled analysis was possible for the comparison of CPM combined with PT versus PT alone at the end of treatment (approximately 2 weeks). Nine trials were included in this comparison (Chiarello 1997b, Colwell 1992, Harms 1991, Kumar 1996, McInnes 1992, Montgomery 1996, Nielsen 1988, Vince 1987, Walker 1991). Treatment was initiated on the first post-operative day for all trials except one in which CPM treatment was started on the second day post-operative . For the outcome of active knee flexion, four studies were included in the pooled analysis, for a total of 286 patients (Chiarello 1997b, Harms 1991, McInnes 1992, Montgomery 1996). Overall, CPM combined with PT significantly increased active knee flexion at 2 weeks post KA (WMD 4.30 degrees, 95% CI: 1.96, 6.63). Statistically significant results were also obtained for length of hospital stay. Six studies were included in the analysis with a total of 382 patients (Colwell 1992, Harms 1991, Kumar 1996, McInnes 1992, Montgomery 1996, Walker 1991). The groups were found to be homogenous for comparison ($p > 0.05$). The treatment groups receiving CPM and PT were found to have a significantly shorter time to discharge (WMD -0.69 days, 95% CI: -1.35, -0.03). Discharge criteria varied amongst trials, and only three trials actually specified their

criteria (Harms 1991, Kumar 1996, Colwell 1992). Positive results were also obtained for the number of patients requiring manipulation post knee arthroplasty. According to data pooled from three trials, (Harms 1991, McInnes 1992, Vince 1987), subjects in the CPM group had a significantly lower incidence of post KA manipulation (RR 0.12, 95% CI: 0.03, 0.53). Groups from the trials proved to be homogeneous and comparable. All three trials began CPM treatment within 24 hours. Statistically significant results were also obtained for the outcome of pain medication intake (WMD -4.18 mg, 95% CI: -7.86, -0.49). 3 studies were combined for comparison for a total of 157 patients (Colwell 1992, Harms 1991, Walker 1991). Lastly, statistically significant results were reported for knee swelling (McInnes 1992, Montgomery 1996), however, there were significant problems with heterogeneity of data.

Pooled analysis revealed that CPM did not significantly improve (results not shown) passive knee flexion, and passive or active knee extension at 2 weeks post knee arthroplasty. For the outcome of passive knee extension, three trials were pooled (Pope 1997, Johnson 1990, Kumar 1996) and were homogeneous for comparison. Two trials measured fixed flexion deformity (Johnson 1990, Pope 1997) while the third measured passive knee extension (Kumar 1996). Passive extension and fixed flexion deformity were considered to be the same outcome as they both represent the limit of available knee extension. For both passive knee flexion (Chiarello 1997b, Kumar 1996) and active knee extension (Chiarello 1997b, McInnes 1992), only 2 trials could be pooled for analysis with 104 and 113 patients included respectively. Neither result was found to be statistically significant (WMD 0.66 degrees, 95% CI: -3.78, 5.10) (WMD -1.06 degrees, 95% CI: -7.53, 5.40).

Results from Individual Studies

Pooled analysis was not possible on other CPM applications. For the comparison of CPM combined with PT versus splinting combined with PT, one trial was included (Johnson 1990). 102 patients were included for comparison. Outcomes were assessed at end of treatment (one-week), and follow up (2 weeks, 6 weeks, 3 months, 6 months, and 1 year). On the outcome of range of motion into knee flexion, statistically significant results favouring the CPM group were found at end of treatment (WMD - 16.00 degrees, 95% CI: 10.52, 21.48), and follow-up at 2 weeks (WMD - 10.00 degrees, 95% CI: 4.35, 15.65), 6 weeks (WMD - 8.00 degrees, 95% CI: 1.32, 14.68), 6 months (WMD - 7.00 degrees, 95% CI: 0.60, 13.40) and 1 year (WMD - 9.00 degrees, 95% CI: 7.63, 10.37). At 3 months, results favoured the CPM group (WMD - 5.00 degrees, 95% CI: -0.64, 10.64), however, were not found to be statistically significant. When comparing CPM applications on treatment parameters, no statistically significant results were found. For the comparison of short time CPM application vs long time CPM application, no statistically significant results were found for the outcomes of active knee flexion, presence of a fixed flexion deformity, analgesic use, or total knee range of motion at end of treatment (Chiarello 1997b). However, only 20 patients were included for comparison. In addition, no difference was found when comparing low range CPM application to high range CPM application for the outcomes of analgesic use, length of hospital stay or knee range of motion at end of treatment, or follow-up at 6 weeks and 1 year (MacDonald 2000, Pope 1997). For the comparison of CPM versus lower limb mobility training combined with PT, no statistically significant results were found on the outcomes of pain, active knee flexion, active knee extension, passive knee extension and gait speed. However, only nineteen patients were included for comparison. Results were measured at end of treatment (1 month).

DISCUSSION

This meta-analysis suggests that CPM combined with physiotherapy intervention is effective at increasing active knee flexion two weeks post knee-arthroplasty relative to physiotherapy intervention alone (Chiarello 1997b, Harms 1991, McInnes 1992, Montgomery 1996). However, the clinical significance of an additional 4 degrees of knee flexion can be questioned. Adequate ROM of the knee, particularly in flexion, is important for performing mobility tasks such as walking, transfers and activities of daily living. A minimum of 65 degrees of knee flexion is required in the swing phase of normal gait, 90 degrees of flexion is required to descend stairs and at least 105 degrees is required to rise from a toilet or a low chair (Fox 1981). Due to its functional importance, knee range of motion was a primary outcome. Results from this meta-analysis suggest however, that although CPM may produce small changes in active knee flexion range in the short-term it does not result in additional range over the long term, one or two years post surgery.

Statistically significant results were also found for the outcome of length of hospital stay. This meta-analysis suggests that patients who receive CPM in addition to PT are discharged home from the hospital earlier than those who receive physiotherapy treatment alone. In the current age of hospital cut-backs and limited resources, even small reductions in length of hospital stay following a surgical procedure may be important. Length of hospital stay was also a primary outcome for the current meta-analysis. However, it is important to consider that length of stay is influenced by other factors besides the amount of active knee flexion achieved.

CPM in addition to physiotherapy intervention also reduced the number of post-operative knee manipulations required relative to physiotherapy alone. It has been suggested in related research that the greatest benefit of CPM appears to be its ability to decrease the number of knee manipulations (McInnes 1992). Manipulation is

used to facilitate the post-operative rehabilitation program for patients with painful, limited ROM of the knee (Fox 1981). However, manipulation is a painful process and an added complication to the initial surgery. Therefore, any reduction in the number of procedures required is beneficial to both the surgeon and the patient, however, the absolute reduction in risk will depend on the baseline risk.

No statistically significant difference was found for the outcome of active or passive knee extension. However, this is not surprising as CPM was designed to improve knee flexion (Chiarello 1997b). It has been suggested that an active hold at the point of maximum extension, activating the quadriceps, would be necessary while utilizing the CPM machine in order to enhance active extension (Chiarello 1997b).

Information on the outcome of pain is limited. It has been suggested that rhythmic joint movement inhibits the pain-spasm reflex (Frank 1984). However, these results were not supported by the limited data available in the current meta-analysis.

Information biases were identified in several trials (Montgomery 1996, Johnson 1990). Heterogeneity of results was also a problem for several outcomes. In several trials the ROM measurements were not specified as being active or passive. These measures need to be performed and reported in standardized manner in order to allow for appropriate comparisons. Heterogeneity or variability may have been introduced in the outcomes measures used, the type of implants used (cemented versus un cemented) and the patient diagnosis. Under ideal circumstances interventions are to be delivered in a blinded fashion. However, in many instances it is impossible to blind patients or clinicians when using physical interventions. This however, could introduce bias into the study. Due to the limited sample size, subgroup analysis could not be performed based on methodological quality of the included studies. However, the mean methodological quality was low (2/5) and could have introduced bias into the results.

Protocols were another area in which bias may have been introduced. Protocols differed from trial to trial and in some cases, treatment parameters were not reported adequately . For the main comparison of CPM combined with PT versus PT alone, 5 studies provided identical PT treatment to the experimental and control groups (Chiarello 1997b, Harms 1991, McInnes 1992, Nielsen 1988, Vince 1987), while four studies were found to have provided one group additional PT (Colwell 1992, Kumar 1996, Montgomery 1996, Walker 1991). In addition, there is no consensus on the clinical application characteristics such as selected ROM for treatment, treatment duration or intensity of application. Several studies (Chiarello 1997b, MacDonald 2000, Pope 1997) attempted to compare CPM duration and treatment ROM. However, data could not be pooled and the sample size was low for individual trials. Lastly, physiotherapy interventions were not uniform, all included studies provided a different physiotherapy intervention. It is not clear what effect these differences may have on the reported efficacy of CPM.

Another important factor which could influence results is the use of pre-operative exercises as part of the rehabilitation protocol for KA. There is no consensus regarding the effect of pre-operative physiotherapy in total knee arthroplasty, however it has been suggested that the decrease in muscle strength observed post surgery may be reduced through implementation of a pre-operative physiotherapy regime (Rodgers 1998) .

The failure to use validated outcome measures is also a limitation of the current study. No functional activities (sit to stand, supine to sit, ambulation, stair climbing, ambulation velocity, PF MP) were assessed using validated outcome measure scales in any of the studies. As the focus of PT treatment is aimed increasingly at functional activities, the outcome measures used should reflect this situation.

Based on the results of this meta-analysis, CPM combined with conventional PT was found to produce small increases in active knee flexion range. In addition, length of hospital stay was decreased significantly. The inclusion of CPM also produces large relative reductions in risk of manipulation, which may translate into large or small absolute risk reductions, depending on the baseline risk.

We recommend that future studies should concentrate on having uniform protocols for CPM application (increment increase, application time). In addition, outcome measures should reflect current, functional treatment goals and be measured in a standardized fashion using valid and reliable tools.

AUTHORS' CONCLUSIONS

Implications for practice

CPM combined with conventional PT may be utilized to produce small increases in active knee flexion range, decrease length of hospital stay and reduce the risk of manipulation following total knee arthroplasty. These potential benefits will need to be carefully weighed against the inconvenience and expense of CPM.

Implications for research

Further studies are required to assess the differences in CPM effectiveness with different characteristics of application such as total duration of treatment and intensity of CPM interventions, different characteristics of patients and of the disease. In addition, the effect of CPM when combined and compared to various PT regimes should be studied further.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Chen 2000

Methods	Randomized, single-blinded study Sample size: Gr 1 : 23 Gr 2 : 28 Treatment duration : 1 wk Mid-treatment 3 days
Participants	Inclusion: TKA Exclusion : bilateral TKA, intolerance of CPM machine, significant wound drainage or wound infection, TKA revision, weight >= 240 lbs (to ensure proper fitting in a standard CPM machine) Mean age (range): Male : 72 (46-91) Female : 65 (40-86) Gender : Gr 1 : 6M/17F Gr 2 : 9M/19F
Interventions	Gr 1 : CPM + PT : CPM started within 24 hrs of admission; initially set from 0° to approx. 60° (10 dgrs less than passive knee flexion); knee flexion increased daily as tolerated by patient. 5hrs CPM /day. Also PT Gr 2 : PT only : 2 hrs per day of PT and 1 hr per day of OT
Outcomes	1- ROM - Passive Knee Flexion (degrees) 2- ROM - Passive Knee Extension (degrees) 3- Knee circumference (cm) 4- Length of Stay (days)
Notes	R=1 B=0 W=0

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Chiarello 1997

Methods	Randomized, open study. Sample size at entry: 49 Treatment duration: discharge (D/C) or 2 wks post-surgery. Data Analysis: Intention to treat
Participants	Pts with degenerative joint disease undergoing TKA. Inclusion: primary and unilateral TKA. Mean Age (SD): Gr1: 70.9 (9.7) Gr2: 74.2 (9.1) Gr3: 74.2 (6.3) Gr4: 71.2 (9.8) Gr5: 62.7 (10.3) % Female: 73.9
Interventions	Treatment started on either post-surg. day (POD) 1, 2 or 3. Gr1: CPM 4.3 hrs/day (SD=1.5), ROM increment 7 degrees/day (SD=5.3) Gr2: CPM 4.1hrs/day (SD=1.0) ROM increment 6.0 degrees/day (SD=5.0) Gr3: CPM 6.6 hrs/day (SD=4.4) ROM increment 6.0 degrees/day (SD=5.0) Gr4: CPM 8.0 hrs/day (SD=3.1) ROM increment 7.0 degrees/day (SD=7.8) Gr5: Control (Concurrent treatment only) Concurrent treatment: PT: gait training, transfers, education, moist heat, strength & ROM ex's. Surgery: variety of prosthetics & surgical procedures,7surgeons
Outcomes	AROM (flex), PROM (flex, ext)
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Colwell 1992

Methods	Randomized, open study. Sample size at entry: 22 Treatment duration: until D/C (criteria = 90 Dgrs AROM, independent straight leg raise (SLR)& activities of daily living (ADL's)). Follow up: 1, 6, 12 months Data Analysis: Effectiveness
Participants	Patients diagnosed with OA or RA. Inclusion: primary elective TKA Exclusion: TKA revisions, bilat TKA, TKA requiring post-surg. manipulation. Age: Gr1: 72.7 Gr2: 73.6

Colwell 1992 (*Continued*)

	% Female: Gr1: 66.7 Gr2: 70.0 % OA: 95.4
Interventions	Gr1: CPM starting in recovery room 0-40 dgrs. Increments: 10 dgrs/day as tolerated. Allowed to stop device for limited periods. PT starting on POD1 as per control gr, plus AROM & PROM activities. Gr2: Splinting x 3 days. PT 2x/day (initiated on POD1):Transfert, Gait training, SLR. AROM & PROM added after removal of the splint on 3rd day. Surgery: 1 surgeon, cemented total condylar prostheses.
Outcomes	ROM (flex, ext), Length of stay (LOS)(days), medication intake(dose equivalency system)
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Harms 1991

Methods	Randomized, open trial. Sample size at entry: 113 Treatment duration: until hospital D/C Data Analysis: Intention to treat
Participants	Inclusion: diagnosis of OA or RA, primary TKA, knee flex. contracture < 40 Dgrs, pre-surg. condition- - able to walk 10 metres within 2 min with walking aid, able to rise from chair with arm rests and seat height of 18 in. Exclusion: Revision, concurrent knee surgery, condition comprising treatment. Mean age (SD): Gr1: 69 (9) Gr2: 71 (10) Gr1: 78.2%F Gr2: 93.1%F %OA: Gr1: 63.6 Gr2: 63.8
Interventions	Gr1: CPM initiated in recovery room, 0-40 degrees x first 48 hrs post-surg, approx. 2 Dgrs/sec. Increments: 10 dgrs/day as tolerated, CPM 6hrs/day. Immobilized in splint or back slab while off CPM. Treatment applied until 80 dgrs of flex achieved. Gr2: Control (only concurrent treatment) Concurrent treatment: All patients familiar to the exs programme before surgery. POD 1: splint, static quads contractions progressing towards SLR, ankle + gluteal ex's POD 2: mobilize with splint POD 3: active knee flex, inner range quads exs, splint removed POD 5: mobilize without splint if dynamic control of knee ext. or proper SLR Treatment 2 X /day, minimum. of 10 min/session

Harms 1991 (*Continued*)

Outcomes	LOS (days), analgesic intake (ml morphine equivalent), ROM (flex, ext), pain (VAS 0-100), Ease-score (VAS 0-100)
Notes	R=2 B=0 W=0

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Johnson 1990

Methods	Randomized, controlled trial. Sample size at entry: 102 Data Analysis: Intention to treat Treatment duration: 7 days Follow-up: 10 days; 2 & 6 wks; 3, 6 & 12 mo.
Participants	Inclusion: Primary replacement of the knee Exclusion: infective focus, diabetes, peripheral vascular disease, corticosteroid therapy, scars. Gr1: 13RA/37OA Gr2:12RA/40OA
Interventions	Gr1: CPM apparatus on x 20hrs first 3days and 16hrs x the following 4days. ROM 0-10dgrs on 1st day, increased of 10dgrs/day until 90dgrs reached (on 6th day). Exs involving full knee ext performed 2x/day. Active knee flex & ext allowed on 7th day. Gr2: (Immobilization) Splint x 7days = knee flex not allowed before 7th day. SLR exs performed 2x/day. Weight bearing started on the 3rd day for both groups.
Outcomes	LOS, fixed flex deformity, ext. lag, ROM (flex).
Notes	R=1 B=0 W=0

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kumar 1996

Methods	Randomized open trial. Sample size at entry: 73 pts (83 knees) Treatment duration: until D/C. criteria: dry wound, 80 Dgrs flex. ambulation 300 feet 2 X/ day with single crutch or cane, independent transfers. If criteria not met by POD 5, pt sent to rehab. Follow up: 6 wks, 3 mths, 6 mths. Data Analysis: Effectiveness
Participants	Inclusion: OA only, TKA Mean Age (range): Gr1: 69.3 (52-86) Gr2: 68.1 (42-88) % Female: Gr1: 57.5 Gr2: 66.7
Interventions	Gr1: CPM initiated in recovery room at 0-90dgrs. 10hrs/day. Immobilization at night. Gr2 (Drop & Dangle technique): Post-op immobilization POD1: immobilization removed, PROM x 20min (progressed to 30-45min), 2x/day 90dgrs flex achieved at each session. Concurrent treatment: PT daily x 2hrs isometric exs, PROM, A-AROM, gait training (including stairs) FES if extensor lag >30dgrs or if no independent SLR performed on POD 3. Surgery: 2 surgeons, cemented prostheses
Outcomes	PROM (flex, ext), LOS(days), extension lag, Number of pt's D/C home vs rehab
Notes	R=2 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

MacDonald 2000

Methods	Randomized Clinical Trial, single blinded. Sample size at entry : 120 Gr 1 : 40 Gr 2 : 40 Gr 3 : 40 Treatment duration : 18-24 hrs Follow-up : aproximatly 1wk, 6 wks and 52 wks
Participants	Inclusion : Less tant 80 yrs of age with primary OA, no previous surgery on the knee, normal functioning ipsilateral hips, ability to tolerate NSAIDs and marcaine, ability to ambulate 30m preoperatively, ability to climb 10 steps

MacDonald 2000 (*Continued*)

	Exclusion :RA, greater than 15° valgus or fixed flexion deformity Age/Gender : Not reported
Interventions	Gr 1 : No CPM Gr 2 : CPM from 0°-50° : 0°-50° initially then progressive increment changes of 10° each hour as tolerated by patient Gr 3 : CPM from 70°-110° : 70°-110° with no increment changes. CPM initiated in recovery room; min. of 18 hrs, max. of 24 hrs, discontinued day after surgery Day after surgery, all patients began a standard PT regimen, twice daily for 6 wks : active flexion and extension, PROM exercises, mobilized as tolerated using walker or crutches
Outcomes	1- Pain (Analgesic use) (mg) 2- ROM - Knee Flexion (degrees) 3- ROM - Knee Extension (degrees) 4- Length of Stay (days) 5- Knee Society Score
Notes	R=2 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

May 1999

Methods	Randomized single blind clinical trial Gr 1: CPM
Participants	Patients admitted to the GRH who had undergone a primary total knee arthroplasty. Were excluded: those who had a surgical revision or manipulation of the involved knee, knee flexion greater than 80°, more than 14 days after the surgery, incapability to participate in pool therapy, rheumatoid arthritis, inability or unwillingness to provide informed consent. Age: Gr1: 72.8 yrs (3.7) Gr2: 66.3 yrs (9.4) Symptoms duration: Less than 14 days post-op
Interventions	Gr 1: CPM for knee flexion/extension 3 to 5 hrs/day, 7 days/wk, set at full extension and the maximal flexion was set at the maximum tolerated. The therapist sets the CPM and increases it daily with tolerance. Gr 2: LliMB 5 to 10 mins per session, 6 sessions per day, 7 days/wk, those without full active flexion and extension were given instruction on auto-assisted execises while using LliMB. Physical therapy, 1 to 1.5 hrs/day, except on the weekends. The treatment consisted of ice 20 mins, active and auto-assisted ROM and strengthening exercises, GAIT training and pool therapy twice per week for

May 1999 (*Continued*)

	30 mins
Outcomes	ROM: knee flexion active, knee extension active, passive knee extension. Pain (VAS) Walking time for 10m
Notes	R:1 B:0 W:1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

McInnes 1992

Methods	Randomized controlled single-blind trial. Sample size at entry: 102 Data Analysis: Effectiveness Treatment duration: until D/C (datas at 7 days) Follow-up: 6 wks
Participants	Inclusion: Primary TKA, diagnosis of RA or OA (OA defined by roentgenogram, ie unequal cartilage loss, eburnation, osteophytes & subchondral bone cysts in knee), not more than 20 dgrs knee flex contracture, passive knee flex of at least 90 dgrs. Exclusion: cognitive or sensory deficit, did not understand or speak English, undergoing another surgical procedure prior or during TKA, weight >136 kg. Mean age (SD): Gr1: 65.7 (11.1) Gr2: 70.2 (8.7) % Female: Gr1: 65 Gr2: 64 % OA: Gr1: 73 Gr2: 89
Interventions	Gr1:CPM initiated within 24hrs of surgery, device: Sutter9000 or 2000, Increments: as tolerated, Actual CPM hrs/ day (mean): POD 1-3: 12.4, POD 4-7: 8.9. Gr2: Control (only concurrent treatment) Concurrent treatment: Quads strengthening (from POD 1), A-AROM & PROM ex's (flex,ext) (from POD2), gait training, bicycling and proning. Frequency: 1-2 X/ day, 7 days/wk. Surgery: 6 surgeons, variety of prostheses.
Outcomes	AROM (flex, ext), PROM (ext), pain (VAS 0-1), Increase in knee swelling (cm), # requiring manipulation, HAQ (0-3)

McInnes 1992 (*Continued*)

Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Montgomery 1996

Methods	Randomized open trial. Sample size at entry: 68 Data Analysis: Effectiveness Treatment duration: until D/C (criteria: AROM min. 70 degrees, no wound problem, ability to walk + climb stairs, independant with ADL's) (up to 2 wks)
Participants	Inclusion: diagnosis of gonarthosis, primary TKA. Mean age (SD): Gr1: 74 (5) Gr2: 76 (6) % Female: Gr1: 70.6 Gr2: 70.6
Interventions	Gr1:CPM initiated POD 1, 3hrs/session, 3x/day, 7days/wk. Increment until level of pain, Speed 2-6min/cycle (adjusted to level of pain). Gr2: Active PT initiated POD 1. AROM + PROM (assisted by physiotherapist), 30 min/session, 2 x/day, 5 days/wk. Concurrent: Instructed to self-train actively, instruction on gait. Surgery: uncemented porous-coated anatomic. Unicompartmental: CPM:18 APT: 21
Outcomes	LOS (days), ROM (flex), Mid patellar swelling (cm), Pain (VAS 0-10)
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Nielsen 1988

Methods	Randomized open trial. Sample size at entry: 54 Data analysis: Effectiveness Treatment duration: 12 days (datas from 14th day)
Participants	Inclusion: Primary TKA, uncemented ACG-2000 prostheses, diagnosis of arthrosis. Exclusion: Previous TKA in contralat knee. Mean age (range): Gr1: 71 (40-83) Gr2: 72 (37-83)
Interventions	Gr1: CPM initiated POD 2 at 0-25 Dgrs, increment 5-10 dgrs daily. CPM 2hrs/session, 2x/day, until POD 12. Gr2: control (concurrent treatment only) Concurrent treatment: start POD 2: quads strengthening, AROM with full weight bearing
Outcomes	ROM (total, flex), Extension lag, # of patients improved, # patients with no pain
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Pope 1997

Methods	Randomized controlled open trial Sample size at entry: 62 patients (70 knees) Data Analysis: Intention to treat End of treatment: 2 days (datas from 1 wk post-op) Follow up: 1 year
Participants	Inclusion: Diagnosis of OA or RA Exclusion:fixed deformity >30 Dgrs. Mean age (range): Gr1: 72.5 (61-84) Gr2: 72.7 (63-82) Gr3: 69.6 (57-79) % OA: 86 Gr1: 11F/6M Gr2: 9F/9M Gr3: 13F/5M
Interventions	CPM initiated in recovery room both groups with Speed = 1.5 min/cycle, incresed 10dgrs/day x 2 days, apparatus on for at least 20hrs/day. Gr1:CPM 0-40

Pope 1997 (*Continued*)

	Gr2:CPM 0-70 Gr3: ext. splint in recovery room, removed for concurrent treatment. Splint removed POD3 Concurrent treatment: Static quads + gluts contraction, SLR, AROM, ankle pumps, gait training starting POD 3. Frequency: 2x/day, 10 reps of each exs
Outcomes	Fixed flex deformity, total ROM, ROM (flex), analgesic intake (mg morphine), functional score (0-70, 70=best score)
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Vince 1987

Methods	Randomized open trial Sample size at entry: 62 Data Analysis: Intention-to-treat End of treatment 2 wks.
Participants	Inclusion: Patients undergoing primary unilateral total knee arthroplasty. Exclusion: Obese patients (>240 pounds), undergoing bilateral knee arthroplasty. Age: Gr1: 67.6 (44-80) Gr2: 66.0 (47-83) Gr1: 13M / 29F Gr2: 3M / 17F
Interventions	Gr1: CPM initiated in recovery room increased to 0-45dgrs within 2hrs if patient comfortable. CPM use: 20hrs/day, flexion increased daily as patient tolerance. Gr2: No CPM Concurrent Rx: Light-weight, soft knee dressings applied in the operating room. Bed rest x POD 1&2. POD 3: Gait training & active ROM exs under PT supervision
Outcomes	Length of time required to achieve 90dgrs flex (days), # of patients requiring manipulation
Notes	R=1 B=0 W=1

Risk of bias

Item	Authors' judgement	Description

Vince 1987 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Walker 1991

Methods	Randomized controlled open trial Sample size at entry: Phase 1: 22 Gr1A: CPM Gr1B: No CPM Intention to treat Follow-up at one month and twelve months.
Participants	Inclusion: Patients who had a total knee arthroplasty operation. All patients received semi-constrained prostheses. Exclusion: N/R Diagnosis: (OA/RA) GR1A: 11/1 Gr1B: 10/0 Age: Gr1A: (72,7,5,5) Gr1B: (73,6,4,25)
Interventions	Gr1A: CPM Th postoperative regimen included CPM initiated in recovery room with range 0-40°, CPM throughout hospitalization with daily advancement of flexion by 10° to tolerance. Gr1B: No CPM Knee immobilization in extension initiated in the operating room and continued for three days. Different range of motion exercises until POD3. Concurrent therapy: Standardized post UTKA physical therapy initiated on post-operative day 1
Outcomes	1- Length of hospital stay (days) 2- Analgesic use (mg morphine)
Notes	R=1 B=0 W=1

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aubriot 1993	No standard deviation
Beaupré 2001	Mixed population
Davis 1984	Not enough statistical data
Haug 1988	Treatment included electrical stimulation
Johnson 1992	No standard deviation
Kim 1995	
Lau 2001	Number of patients in each group is missing
Lynch 1988	No standard deviation
Maloney 1990	Mixed population
Odenbring 1989	Not TKA subjects
Rasti 2001	Literature review
Simkin 1999	Not enough statistical data; No standard deviation
Ververeli 1995	Not a RCT
Worland 1998	Both groups receive CPM, comparison of CPM + PT versus CPM alone
Yashar 1997	Mixed Population
Young 1984	Not enough statistical data

DATA AND ANALYSES

Comparison 1. CPM + PT vs PT (Approx. Mid-treatment 3 days)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM - Passive knee flexion (degrees)	1	51	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-7.94, 1.94]

Comparison 2. CPM + PT vs PT (Mid-treatment 1 wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain (VAS, 0-10 scale)	1	60	Mean Difference (IV, Fixed, 95% CI)	Not estimable
2 ROM, Active flexion (dgrs)	1	113	Mean Difference (IV, Fixed, 95% CI)	14.0 [5.73, 22.27]
3 Ext/flex deformity (dgrs)	1	113	Mean Difference (IV, Fixed, 95% CI)	-1.42 [-2.69, -0.15]

Comparison 3. CPM + PT (End of treatment approx. 1 wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM - Passive knee flexion (degrees)	1	51	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-8.55, 2.55]
2 ROM - Passive knee extension (degrees)	1	51	Mean Difference (IV, Fixed, 95% CI)	-0.70 [-2.18, 0.78]
3 Knee circumference (cm)	1	51	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-1.35, 0.95]
4 Length of stay (days)	1	51	Mean Difference (IV, Fixed, 95% CI)	0.30 [-1.25, 1.85]

Comparison 4. CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active flexion (dgrs)	4	286	Mean Difference (IV, Fixed, 95% CI)	4.30 [1.96, 6.63]
2 ROM, Passive flexion (dgrs)	2	104	Mean Difference (IV, Fixed, 95% CI)	0.66 [-3.78, 5.10]
3 ROM, Active extension (dgrs)	2	113	Mean Difference (IV, Fixed, 95% CI)	-1.06 [-7.53, 5.40]
4 ROM, Passive extension (dgrs)	3	196	Mean Difference (IV, Fixed, 95% CI)	0.49 [-0.99, 1.97]
5 Length of Hospital Stay (days)	6	382	Mean Difference (IV, Fixed, 95% CI)	-0.69 [-1.35, -0.03]
6 Knee Swelling (cm)	2	153	Mean Difference (IV, Fixed, 95% CI)	-1.79 [-2.05, -1.53]

7 Pain (VAS, 0-10 scale)	1	92	Mean Difference (IV, Fixed, 95% CI)	-0.80 [-1.64, 0.04]
8 Pain (analgesic use) (mg)	3	157	Mean Difference (IV, Fixed, 95% CI)	-4.18 [-7.86, -0.49]
9 no. of pts without pain during mobilisation	1	50	Odds Ratio (M-H, Fixed, 95% CI)	5.89 [0.27, 129.15]
10 no. of pts with ROM improvement	1	50	Odds Ratio (M-H, Fixed, 95% CI)	2.0 [0.58, 6.85]
11 Extension Lag (dgrs)	1	50	Mean Difference (IV, Fixed, 95% CI)	1.0 [-1.44, 3.44]
12 no. of pts needing post-op manipulation	3	264	Odds Ratio (M-H, Fixed, 95% CI)	0.11 [0.02, 0.49]
13 No. of pts discharged home	1	83	Odds Ratio (M-H, Fixed, 95% CI)	0.86 [0.35, 2.09]
14 Quadriceps Strength (Nm)	1	92	Mean Difference (IV, Fixed, 95% CI)	1.60 [-1.88, 5.08]
15 Rate of change in passive flexion (dgrs/day)	1	21	Mean Difference (IV, Fixed, 95% CI)	0.40 [-1.48, 2.28]
16 Rate of change in active flexion (dgrs/day)	1	21	Mean Difference (IV, Fixed, 95% CI)	2.50 [-0.01, 5.01]
17 Rate of change in passive extension (dgrs/day)	1	21	Mean Difference (IV, Fixed, 95% CI)	0.21 [-0.64, 1.06]
18 Rate of change in active extension (dgrs/day)	1	21	Mean Difference (IV, Fixed, 95% CI)	Not estimable
19 Ext/flex deformity (dgrs)	1	113	Mean Difference (IV, Fixed, 95% CI)	-3.80 [-6.04, -1.56]
20 Length of time required to achieve 90dgrs flex (days)	1	62	Mean Difference (IV, Fixed, 95% CI)	-4.70 [-7.37, -2.03]

Comparison 5. CPM + PT vs PT (Follow-up approx. 1wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active flexion (dgrs)	1	39	Mean Difference (IV, Fixed, 95% CI)	21.5 [13.53, 29.47]
2 Length of stay (days)	1	80	Mean Difference (IV, Fixed, 95% CI)	0.10 [-0.45, 0.65]
3 ROM, Total (dgrs)	1	39	Mean Difference (IV, Fixed, 95% CI)	19.0 [10.38, 27.62]
4 Pain (analgesic use) (mg)	2	119	Mean Difference (IV, Fixed, 95% CI)	25.47 [12.97, 37.96]
5 Flexion deformity (dgrs)	1	39	Mean Difference (IV, Fixed, 95% CI)	2.00 [-1.25, 5.25]

Comparison 6. CPM + PT vs PT (follow-up 1 month)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Extension (degrees)	1	21	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-6.56, 0.56]

Comparison 7. CPM + PT vs PT (Follow-up 6wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	2	163	Mean Difference (IV, Fixed, 95% CI)	-2.77 [-6.77, 1.23]
2 ROM, Extension (dgrs)	1	83	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-6.48, 5.28]
3 HAQ (0-3 scale)	1	87	Mean Difference (IV, Fixed, 95% CI)	0.05 [-0.11, 0.21]

Comparison 8. CPM + PT vs PT (Follow-up 3 mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	74	Mean Difference (IV, Fixed, 95% CI)	-3.5 [-8.70, 1.70]
2 ROM, Extension (dgrs)	1	74	Mean Difference (IV, Fixed, 95% CI)	2.0 [-1.57, 5.57]

Comparison 9. CPM + PT vs PT (Follow-up 6 mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	2	60	Mean Difference (IV, Fixed, 95% CI)	1.93 [-0.25, 4.11]
2 ROM, Extension (dgrs)	2	60	Mean Difference (IV, Fixed, 95% CI)	1.32 [0.27, 2.37]

Comparison 10. CPM + PT vs PT (Follow-up 1yr)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active flexion (dgrs)	3	136	Mean Difference (IV, Fixed, 95% CI)	1.02 [-0.04, 2.09]
2 Fixed flexion deformity (dgrs)	1	39	Mean Difference (IV, Fixed, 95% CI)	-1.80 [-4.43, 0.83]
3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70 = better)	1	39	Mean Difference (IV, Fixed, 95% CI)	Not estimable
4 ROM, Total (dgrs)	1	39	Mean Difference (IV, Fixed, 95% CI)	3.90 [-19.26, 27.06]
5 ROM, Extension (dgrs)	2	97	Mean Difference (IV, Fixed, 95% CI)	Not estimable
6 Knee Function (Knee Society Score) (0-200 scale)	1	80	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 11. CPM + PT vs Splinting (End of treatment 1 wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	16.0 [10.53, 21.47]
2 Extension lag (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	1.0 [-1.53, 3.53]
3 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 12. CPM + PT vs Splinting (Follow-up 2 wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	10.0 [4.35, 15.65]
2 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Extension lag (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 13. CPM + PT vs Splinting (Follow-up 6 wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	8.0 [1.32, 14.68]
2 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	1.0 [-0.16, 2.16]
3 Extension lag (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	-1.0 [-3.08, 1.08]

Comparison 14. CPM + PT vs Splinting (Follow-up 3 mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	5.0 [-0.64, 10.64]
2 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	1.0 [-0.16, 2.16]
3 Extension lag (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	-2.0 [-3.59, -0.41]

Comparison 15. CPM + PT vs Splinting (Follow-up 6 mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	7.00 [0.60, 13.40]
2 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Extension lag (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	-1.0 [-2.97, 0.97]

Comparison 16. CPM + PT vs Splinting (Follow-up 1yr)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	9.0 [7.63, 10.37]
2 Fixed flexion deformity (dgrs)	1	102	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 17. CPM + PT vs Splinting (Follow-up 42mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Flexion (dgrs)	0	0	Mean Difference (IV, Fixed, 95% CI)	Not estimable

Comparison 18. Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active flexion (dgrs)	1	20	Mean Difference (IV, Fixed, 95% CI)	2.90 [-4.63, 10.43]
2 ROM, Passive flexion (dgrs)	1	20	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 ROM, Active extension (dgrs)	1	20	Mean Difference (IV, Fixed, 95% CI)	4.20 [-2.84, 11.24]
4 ROM, Passive extension (dgrs)	1	20	Mean Difference (IV, Fixed, 95% CI)	-1.20 [-6.13, 3.73]
5 Rate of change in passive flexion (dgrs/day)	1	20	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-1.79, 1.39]
6 Rate of change in active flexion (dgrs/day)	1	20	Mean Difference (IV, Fixed, 95% CI)	-1.40 [-3.82, 1.02]
7 Rate of change in passive extension (dgrs/day)	1	20	Mean Difference (IV, Fixed, 95% CI)	0.09 [-0.86, 1.04]
8 Rate of change in active extension (dgrs/day)	1	20	Mean Difference (IV, Fixed, 95% CI)	0.10 [-1.58, 1.78]

Comparison 19. Small range CPM vs Bigger range CPM (Follow-up 1wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active flexion (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	-8.0 [-19.85, 3.85]
2 ROM, Total (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	-10.90 [-23.70, 1.90]
3 Analgesic Use (mg morphine)	1	38	Mean Difference (IV, Fixed, 95% CI)	-8.90 [-15.36, -2.44]
4 Flexion deformity (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	3.10 [-1.92, 8.12]

Comparison 20. Small range CPM vs Bigger range CPM (Follow-up 1yr)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM, Active Flexion (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	1.80 [-6.40, 10.00]
2 Fixed flexion deformity (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	1.60 [-1.54, 4.74]
3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70=better)	1	38	Mean Difference (IV, Fixed, 95% CI)	4.0 [-27.36, 35.36]
4 ROM, Total (dgrs)	1	38	Mean Difference (IV, Fixed, 95% CI)	0.10 [-0.48, 0.68]

Comparison 21. CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain (VAS 0-10 scale)	1	19	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-2.60, 1.40]
2 ROM - Active Knee Flexion (degrees)	1	19	Mean Difference (IV, Fixed, 95% CI)	0.30 [-6.51, 7.11]
3 ROM - Active Knee Extension (degrees)	1	19	Mean Difference (IV, Fixed, 95% CI)	-3.40 [-10.11, 3.31]
4 ROM - Passive Knee Extension (degrees)	1	19	Mean Difference (IV, Fixed, 95% CI)	0.20 [-4.39, 4.79]
5 Walking Time for 10m (s)	1	19	Mean Difference (IV, Fixed, 95% CI)	11.5 [-15.72, 38.72]

Comparison 22. Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up approx. 1 wk)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pain (analgesic use) (mg)	1	80	Mean Difference (IV, Fixed, 95% CI)	16.0 [-2.82, 34.82]
2 Length of stay (days)	1	80	Mean Difference (IV, Fixed, 95% CI)	0.20 [-0.42, 0.82]

Comparison 23. Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 6 wks)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM - Knee flexion (degrees)	1	80	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-8.28, 2.28]

Comparison 24. Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 1 yr)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ROM - Knee flexion (degrees)	1	80	Mean Difference (IV, Fixed, 95% CI)	1.0 [-2.51, 4.51]
2 ROM - Knee extension (degrees)	1	80	Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Knee Funciton (Knee Society Score) (0-200 scale)	1	80	Mean Difference (IV, Fixed, 95% CI)	1.0 [-8.05, 10.05]

Analysis 1.1. Comparison 1 CPM + PT vs PT (Approx. Mid-treatment 3 days), Outcome 1 ROM - Passive knee flexion (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 1 CPM + PT vs PT (Approx. Mid-treatment 3 days)

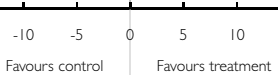
Outcome: 1 ROM - Passive knee flexion (degrees)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chen 2000	23	78 (9)	28	81 (8.9)		100.0 %	-3.00 [-7.94, 1.94]
Total (95% CI)	**23**		**28**			**100.0 %**	**-3.00 [-7.94, 1.94]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.19 (P = 0.23)

Test for subgroup differences: Not applicable



Analysis 2.1. Comparison 2 CPM + PT vs PT (Mid-treatment 1 wk), Outcome 1 Pain (VAS, 0-10 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 2 CPM + PT vs PT (Mid-treatment 1 wk)

Outcome: 1 Pain (VAS, 0-10 scale)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Montgomery 1996	28	5 (2.5)	32	5 (1.5)		100.0 %	0.0 [-1.06, 1.06]
Total (95% CI)	**28**		**32**			**100.0 %**	**0.0 [-1.06, 1.06]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable

Analysis 2.2. Comparison 2 CPM + PT vs PT (Mid-treatment 1 wk), Outcome 2 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 2 CPM + PT vs PT (Mid-treatment 1 wk)

Outcome: 2 ROM, Active flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Harms 1991	55	68 (22.41)	58	54 (22.41)		100.0 %	14.00 [5.73, 22.27]
Total (95% CI)	**55**		**58**			**100.0 %**	**14.00 [5.73, 22.27]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.32 (P = 0.00090)

Test for subgroup differences: Not applicable

Analysis 2.3. Comparison 2 CPM + PT vs PT (Mid-treatment 1 wk), Outcome 3 Ext/flex deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 2 CPM + PT vs PT (Mid-treatment 1 wk)

Outcome: 3 Ext/flex deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Harms 1991	55	6.56 (3.43)	58	7.98 (3.43)		100.0 %	-1.42 [-2.69, -0.15]
Total (95% CI)	**55**		**58**			**100.0 %**	**-1.42 [-2.69, -0.15]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.20 (P = 0.028)

Test for subgroup differences: Not applicable

Analysis 3.1. Comparison 3 CPM + PT (End of treatment approx. 1 wk), Outcome 1 ROM - Passive knee flexion (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 3 CPM + PT (End of treatment approx. 1 wk)

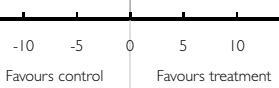
Outcome: 1 ROM - Passive knee flexion (degrees)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chen 2000	23	87 (10.1)	28	90 (10)		100.0 %	-3.00 [-8.55, 2.55]
Total (95% CI)	**23**		**28**			**100.0 %**	**-3.00 [-8.55, 2.55]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.06 (P = 0.29)

Test for subgroup differences: Not applicable



Analysis 3.2. Comparison 3 CPM + PT (End of treatment approx. 1 wk), Outcome 2 ROM - Passive knee extension (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 3 CPM + PT (End of treatment approx. 1 wk)

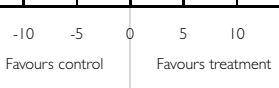
Outcome: 2 ROM - Passive knee extension (degrees)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chen 2000	23	-3.7 (2.5)	28	-3 (2.9)		100.0 %	-0.70 [-2.18, 0.78]
Total (95% CI)	**23**		**28**			**100.0 %**	**-0.70 [-2.18, 0.78]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.93 (P = 0.35)

Test for subgroup differences: Not applicable



Analysis 3.3. Comparison 3 CPM + PT (End of treatment approx. 1 wk), Outcome 3 Knee circumference (cm).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 3 CPM + PT (End of treatment approx. 1 wk)

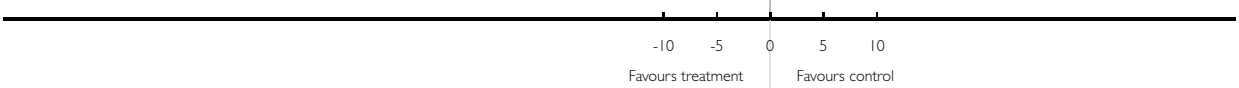
Outcome: 3 Knee circumference (cm)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chen 2000	23	17.9 (2.3)	28	18.1 (1.8)		100.0 %	-0.20 [-1.35, 0.95]
Total (95% CI)	**23**		**28**			**100.0 %**	**-0.20 [-1.35, 0.95]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.34 (P = 0.73)

Test for subgroup differences: Not applicable



Analysis 3.4. Comparison 3 CPM + PT (End of treatment approx. 1 wk), Outcome 4 Length of stay (days).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 3 CPM + PT (End of treatment approx. 1 wk)

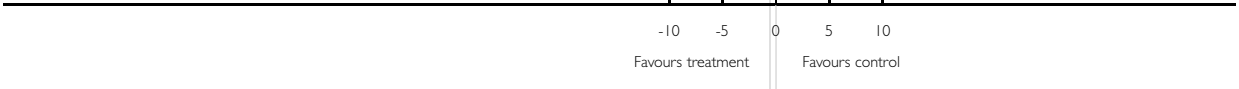
Outcome: 4 Length of stay (days)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chen 2000	23	8.4 (2.9)	28	8.1 (2.7)		100.0 %	0.30 [-1.25, 1.85]
Total (95% CI)	**23**		**28**			**100.0 %**	**0.30 [-1.25, 1.85]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.38 (P = 0.70)

Test for subgroup differences: Not applicable



Analysis 4.1. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 1 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 1 ROM, Active flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	77.1 (10)	10	71.4 (12.86)		5.5 %	5.70 [-4.22, 15.62]
Harms 1991	55	82.08 (11.96)	58	75.6 (11.96)		27.9 %	6.48 [2.07, 10.89]
McInnes 1992	47	82 (11.38)	45	75 (11.38)		25.1 %	7.00 [2.35, 11.65]
Montgomery 1996	28	77 (8)	32	76 (6)		41.5 %	1.00 [-2.62, 4.62]
Total (95% CI)	**141**		**145**			**100.0 %**	**4.30 [1.96, 6.63]**

Heterogeneity: Chi^2 = 5.50, df = 3 (P = 0.14); I^2 =45%

Test for overall effect: Z = 3.61 (P = 0.00030)

Test for subgroup differences: Not applicable

Analysis 4.2. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 2 ROM, Passive flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

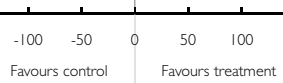
Outcome: 2 ROM, Passive flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	87.1 (7.14)	10	80 (12.86)		24.2 %	7.10 [-1.92, 16.12]
Kumar 1996	46	83.1 (11.5)	37	84.5 (12)		75.8 %	-1.40 [-6.50, 3.70]
Total (95% CI)	**57**		**47**			**100.0 %**	**0.66 [-3.78, 5.10]**

Heterogeneity: Chi^2 = 2.59, df = 1 (P = 0.11); I^2 =61%

Test for overall effect: Z = 0.29 (P = 0.77)

Test for subgroup differences: Not applicable



Analysis 4.3. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 3 ROM, Active extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 3 ROM, Active extension (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	15 (5.38)	10	16.2 (17.69)		32.1 %	-1.20 [-12.62, 10.22]
McInnes 1992	47	24 (19.18)	45	25 (19.18)		67.9 %	-1.00 [-8.84, 6.84]
Total (95% CI)	**58**		**55**			**100.0 %**	**-1.06 [-7.53, 5.40]**

Heterogeneity: Chi^2 = 0.00, df = 1 (P = 0.98); I^2 =0.0%

Test for overall effect: Z = 0.32 (P = 0.75)

Test for subgroup differences: Not applicable

Analysis 4.4. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 4 ROM, Passive extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

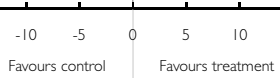
Outcome: 4 ROM, Passive extension (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	6.2 (5.38)	10	6.2 (5.38)		10.3 %	0.0 [-4.61, 4.61]
Kumar 1996	46	9.3 (4.5)	37	9.2 (5.5)		45.4 %	0.10 [-2.10, 2.30]
McInnes 1992	47	7 (5.45)	45	6 (5.45)		44.2 %	1.00 [-1.23, 3.23]
Total (95% CI)	**104**		**92**			**100.0 %**	**0.49 [-0.99, 1.97]**

Heterogeneity: Chi^2 = 0.37, df = 2 (P = 0.83); I^2 =0.0%

Test for overall effect: Z = 0.65 (P = 0.52)

Test for subgroup differences: Not applicable



Analysis 4.5. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 5 Length of Hospital Stay (days).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

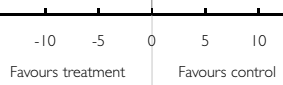
Outcome: 5 Length of Hospital Stay (days)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	12	9.9 (2.75)	10	10.9 (1.5)		13.2 %	-1.00 [-2.81, 0.81]
Harms 1991	55	17 (4)	58	18 (4)		19.9 %	-1.00 [-2.48, 0.48]
Kumar 1996	40	12.1 (9)	33	12.5 (6.75)		3.3 %	-0.40 [-4.02, 3.22]
McInnes 1992	47	10.1 (2.66)	45	10.3 (2.66)		36.7 %	-0.20 [-1.29, 0.89]
Montgomery 1996	28	9 (3)	32	10 (4)		13.7 %	-1.00 [-2.78, 0.78]
Walker 1991	12	9.9 (2.75)	10	10.9 (1.5)		13.2 %	-1.00 [-2.81, 0.81]
Total (95% CI)	**194**		**188**			**100.0 %**	**-0.69 [-1.35, -0.03]**

Heterogeneity: Chi^2 = 1.32, df = 5 (P = 0.93); I^2 =0.0%

Test for overall effect: Z = 2.04 (P = 0.041)

Test for subgroup differences: Not applicable



Analysis 4.6. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 6 Knee Swelling (cm).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

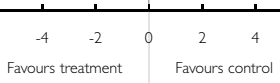
Outcome: 6 Knee Swelling (cm)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
McInnes 1992	48	43.22 (0.67)	45	45.05 (0.64)		97.9 %	-1.83 [-2.10, -1.56]
Montgomery 1996	28	44 (4)	32	44 (3)		2.1 %	0.0 [-1.81, 1.81]
Total (95% CI)	**76**		**77**			**100.0 %**	**-1.79 [-2.05, -1.53]**

Heterogeneity: Chi² = 3.84, df = 1 (P = 0.05); I² =74%

Test for overall effect: Z = 13.33 (P < 0.00001)

Test for subgroup differences: Not applicable



Analysis 4.7. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 7 Pain (VAS, 0-10 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

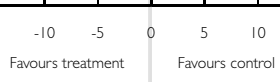
Outcome: 7 Pain (VAS, 0-10 scale)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
McInnes 1992	47	2.8 (2.05)	45	3.6 (2.05)		100.0 %	-0.80 [-1.64, 0.04]
Total (95% CI)	**47**		**45**			**100.0 %**	**-0.80 [-1.64, 0.04]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.87 (P = 0.061)

Test for subgroup differences: Not applicable



Analysis 4.8. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 8 Pain (analgesic use) (mg).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

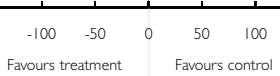
Outcome: 8 Pain (analgesic use) (mg)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	12	9.6 (3.75)	10	14.8 (6.4)		67.1 %	-5.20 [-9.70, -0.70]
Harms 1991	55	28 (19)	58	29 (16)		32.2 %	-1.00 [-7.49, 5.49]
Walker 1991	12	96 (32.75)	10	148 (64.25)		0.7 %	-52.00 [-95.92, -8.08]
Total (95% CI)	**79**		**78**			**100.0 %**	**-4.18 [-7.86, -0.49]**

Heterogeneity: Chi^2 = 5.67, df = 2 (P = 0.06); I^2 =65%

Test for overall effect: Z = 2.22 (P = 0.026)

Test for subgroup differences: Not applicable



Analysis 4.9. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 9 no. of pts without pain during mobilisation.

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

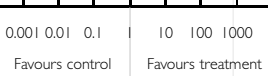
Outcome: 9 no. of pts without pain during mobilisation

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Nielsen 1988	2/24	0/26		100.0 %	5.89 [0.27, 129.15]
Total (95% CI)	**24**	**26**		**100.0 %**	**5.89 [0.27, 129.15]**

Total events: 2 (Treatment), 0 (Control)

Heterogeneity: not applicable

Test for overall effect: Z = 1.13 (P = 0.26)



Analysis 4.10. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 10 no. of pts with ROM improvement.

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 10 no. of pts with ROM improvement

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Nielsen 1988	9/24	6/26		100.0 %	2.00 [0.58, 6.85]
Total (95% CI)	**24**	**26**		**100.0 %**	**2.00 [0.58, 6.85]**
Total events: 9 (Treatment), 6 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.10 (P = 0.27)					

Analysis 4.11. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 11 Extension Lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 11 Extension Lag (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Nielsen 1988	24	5 (3.75)	26	4 (5)		100.0 %	1.00 [-1.44, 3.44]
Total (95% CI)	**24**		**26**			**100.0 %**	**1.00 [-1.44, 3.44]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.80 (P = 0.42)

Test for subgroup differences: Not applicable

Analysis 4.12. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 12 no. of pts needing post-op manipulation.

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 12 no. of pts needing post-op manipulation

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Harms 1991	1/55	5/58		31.3 %	0.20 [0.02, 1.74]
McInnes 1992	0/45	8/44		55.7 %	0.05 [0.00, 0.85]
Vince 1987	0/42	1/20		13.0 %	0.15 [0.01, 3.93]
Total (95% CI)	**142**	**122**		**100.0 %**	**0.11 [0.02, 0.49]**

Total events: 1 (Treatment), 14 (Control)

Heterogeneity: Chi^2 = 0.65, df = 2 (P = 0.72); I^2 =0.0%

Test for overall effect: Z = 2.90 (P = 0.0037)

Analysis 4.13. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 13 No. of pts discharged home.

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 13 No. of pts discharged home

Study or subgroup	Treatment n/N	Control n/N	Odds Ratio M-H,Fixed,95% CI	Weight	Odds Ratio M-H,Fixed,95% CI
Kumar 1996	17/46	15/37		100.0 %	0.86 [0.35, 2.09]
Total (95% CI)	**46**	**37**		**100.0 %**	**0.86 [0.35, 2.09]**
Total events: 17 (Treatment), 15 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.33 (P = 0.74)					

Analysis 4.14. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 14 Quadriceps Strength (Nm).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

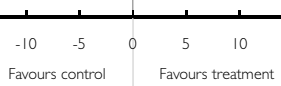
Outcome: 14 Quadriceps Strength (Nm)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
McInnes 1992	47	19.1 (8.52)	45	17.5 (8.52)		100.0 %	1.60 [-1.88, 5.08]
Total (95% CI)	**47**		**45**			**100.0 %**	**1.60 [-1.88, 5.08]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.90 (P = 0.37)

Test for subgroup differences: Not applicable



Analysis 4.15. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 15 Rate of change in passive flexion (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

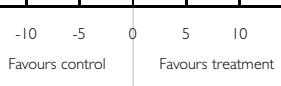
Outcome: 15 Rate of change in passive flexion (dgrs/day)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	3.9 (2.4)	10	3.5 (2)		100.0 %	0.40 [-1.48, 2.28]
Total (95% CI)	**11**		**10**			**100.0 %**	**0.40 [-1.48, 2.28]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.42 (P = 0.68)

Test for subgroup differences: Not applicable



Analysis 4.16. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 16 Rate of change in active flexion (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

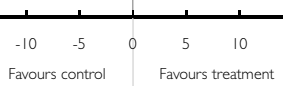
Outcome: 16 Rate of change in active flexion (dgrs/day)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	4.1 (3.7)	10	1.6 (2)		100.0 %	2.50 [-0.01, 5.01]
Total (95% CI)	**11**		**10**			**100.0 %**	**2.50 [-0.01, 5.01]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.95 (P = 0.051)

Test for subgroup differences: Not applicable



Analysis 4.17. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 17 Rate of change in passive extension (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

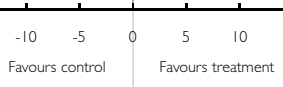
Outcome: 17 Rate of change in passive extension (dgrs/day)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	0.71 (1.4)	10	0.5 (0.3)		100.0 %	0.21 [-0.64, 1.06]
Total (95% CI)	**11**		**10**			**100.0 %**	**0.21 [-0.64, 1.06]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.49 (P = 0.63)

Test for subgroup differences: Not applicable



Analysis 4.18. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 18 Rate of change in active extension (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

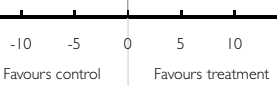
Outcome: 18 Rate of change in active extension (dgrs/day)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	11	0.7 (1.8)	10	0.7 (1)		100.0 %	0.0 [-1.23, 1.23]
Total (95% CI)	**11**		**10**			**100.0 %**	**0.0 [-1.23, 1.23]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable



Analysis 4.19. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 19 Ext/flex deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

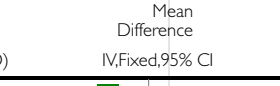
Outcome: 19 Ext/flex deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Harms 1991	55	4.75 (6.08)	58	8.55 (6.08)		100.0 %	-3.80 [-6.04, -1.56]
Total (95% CI)	**55**		**58**			**100.0 %**	**-3.80 [-6.04, -1.56]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.32 (P = 0.00090)

Test for subgroup differences: Not applicable



Analysis 4.20. Comparison 4 CPM + PT vs PT (End of treatment approx. 2 wks), Outcome 20 Length of time required to achieve 90dgrs flex (days).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 4 CPM + PT vs PT (End of treatment approx. 2 wks)

Outcome: 20 Length of time required to achieve 90dgrs flex (days)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Vince 1987	42	9.1 (5.01)	20	13.8 (5.01)		100.0 %	-4.70 [-7.37, -2.03]
Total (95% CI)	**42**		**20**			**100.0 %**	**-4.70 [-7.37, -2.03]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.45 (P = 0.00055)

Test for subgroup differences: Not applicable

Analysis 5.1. Comparison 5 CPM + PT vs PT (Follow-up approx. 1wk), Outcome 1 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 5 CPM + PT vs PT (Follow-up approx. 1wk)

Outcome: 1 ROM, Active flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	78.3 (12.74)	19	56.8 (12.64)		100.0 %	21.50 [13.53, 29.47]
Total (95% CI)	**20**		**19**			**100.0 %**	**21.50 [13.53, 29.47]**

Heterogeneity: not applicable

Test for overall effect: Z = 5.29 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 5.2. Comparison 5 CPM + PT vs PT (Follow-up approx. 1wk), Outcome 2 Length of stay (days).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 5 CPM + PT vs PT (Follow-up approx. 1wk)

Outcome: 2 Length of stay (days)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	5.2 (1.3)	40	5.1 (1.2)		100.0 %	0.10 [-0.45, 0.65]
Total (95% CI)	**40**		**40**			**100.0 %**	**0.10 [-0.45, 0.65]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.36 (P = 0.72)

Test for subgroup differences: Not applicable

Analysis 5.3. Comparison 5 CPM + PT vs PT (Follow-up approx. 1wk), Outcome 3 ROM, Total (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 5 CPM + PT vs PT (Follow-up approx. 1wk)

Outcome: 3 ROM, Total (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	69.5 (13.76)	19	50.5 (13.7)		100.0 %	19.00 [10.38, 27.62]
Total (95% CI)	**20**		**19**			**100.0 %**	**19.00 [10.38, 27.62]**

Heterogeneity: not applicable

Test for overall effect: Z = 4.32 (P = 0.000016)

Test for subgroup differences: Not applicable

Analysis 5.4. Comparison 5 CPM + PT vs PT (Follow-up approx. 1wk), Outcome 4 Pain (analgesic use) (mg).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 5 CPM + PT vs PT (Follow-up approx. 1wk)

Outcome: 4 Pain (analgesic use) (mg)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	88 (51)	40	80 (51)		31.2 %	8.00 [-14.35, 30.35]
Pope 1997	20	81.5 (24.08)	19	48.1 (23.91)		68.8 %	33.40 [18.33, 48.47]
Total (95% CI)	**60**		**59**			**100.0 %**	**25.47 [12.97, 37.96]**

Heterogeneity: Chi² = 3.41, df = 1 (P = 0.06); I² =71%

Test for overall effect: Z = 4.00 (P = 0.000065)

Test for subgroup differences: Not applicable

Analysis 5.5. Comparison 5 CPM + PT vs PT (Follow-up approx. 1wk), Outcome 5 Flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 5 CPM + PT vs PT (Follow-up approx. 1wk)

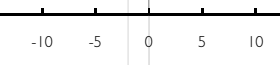
Outcome: 5 Flexion deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	8.2 (5.78)	19	6.2 (4.54)		100.0 %	2.00 [-1.25, 5.25]
Total (95% CI)	**20**		**19**			**100.0 %**	**2.00 [-1.25, 5.25]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.20 (P = 0.23)

Test for subgroup differences: Not applicable



Analysis 6.1. Comparison 6 CPM + PT vs PT (follow-up 1 month), Outcome 1 ROM, Extension (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 6 CPM + PT vs PT (follow-up 1 month)

Outcome: 1 ROM, Extension (degrees)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	12	6 (4.12)	9	9 (4.12)		100.0 %	-3.00 [-6.56, 0.56]
Total (95% CI)	**12**		**9**			**100.0 %**	**-3.00 [-6.56, 0.56]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.65 (P = 0.099)

Test for subgroup differences: Not applicable

Analysis 7.1. Comparison 7 CPM + PT vs PT (Follow-up 6wks), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 7 CPM + PT vs PT (Follow-up 6wks)

Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Kumar 1996	46	104.9 (13.42)	37	104.1 (13.42)		47.4 %	0.80 [-5.01, 6.61]
MacDonald 2000	40	98 (11)	40	104 (14)		52.6 %	-6.00 [-11.52, -0.48]
Total (95% CI)	**86**		**77**			**100.0 %**	**-2.77 [-6.77, 1.23]**

Heterogeneity: Chi^2 = 2.77, df = 1 (P = 0.10); I^2 =64%

Test for overall effect: Z = 1.36 (P = 0.17)

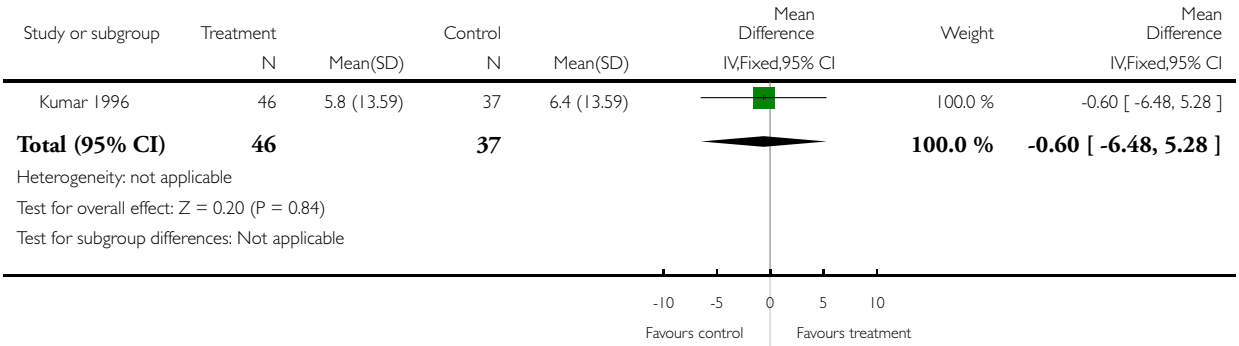
Test for subgroup differences: Not applicable

Analysis 7.2. Comparison 7 CPM + PT vs PT (Follow-up 6wks), Outcome 2 ROM, Extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 7 CPM + PT vs PT (Follow-up 6wks)

Outcome: 2 ROM, Extension (dgrs)

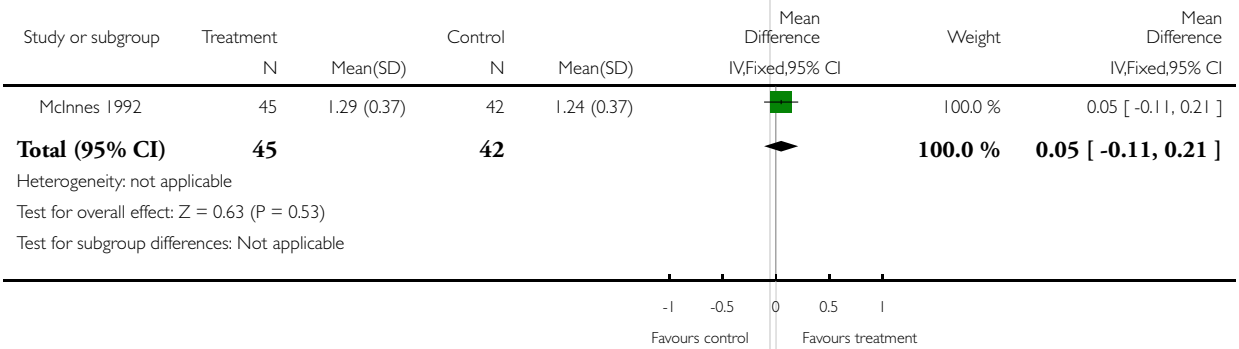


Analysis 7.3. Comparison 7 CPM + PT vs PT (Follow-up 6wks), Outcome 3 HAQ (0-3 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 7 CPM + PT vs PT (Follow-up 6wks)

Outcome: 3 HAQ (0-3 scale)

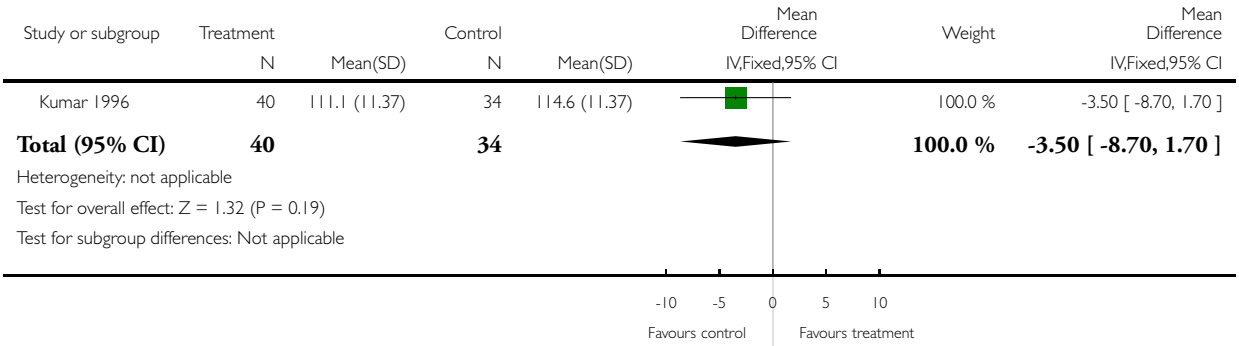


Analysis 8.1. Comparison 8 CPM + PT vs PT (Follow-up 3 mo), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 8 CPM + PT vs PT (Follow-up 3 mo)

Outcome: 1 ROM, Flexion (dgrs)

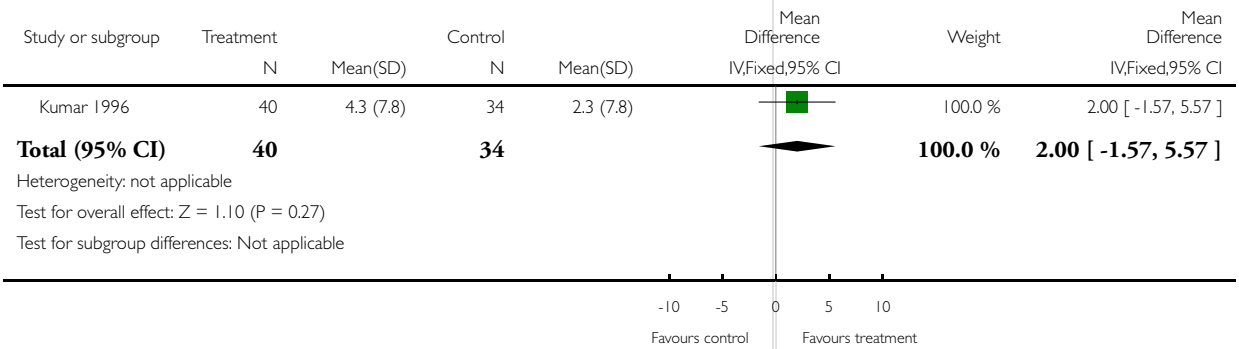


Analysis 8.2. Comparison 8 CPM + PT vs PT (Follow-up 3 mo), Outcome 2 ROM, Extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 8 CPM + PT vs PT (Follow-up 3 mo)

Outcome: 2 ROM, Extension (dgrs)



Analysis 9.1. Comparison 9 CPM + PT vs PT (Follow-up 6 mo), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 9 CPM + PT vs PT (Follow-up 6 mo)

Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	12	96 (2.47)	7	94 (2.47)		89.7 %	2.00 [-0.30, 4.30]
Kumar 1996	27	115.2 (10.53)	14	113.9 (10.53)		10.3 %	1.30 [-5.50, 8.10]
Total (95% CI)	**39**		**21**			**100.0 %**	**1.93 [-0.25, 4.11]**

Heterogeneity: Chi² = 0.04, df = 1 (P = 0.85); I² =0.0%

Test for overall effect: Z = 1.73 (P = 0.083)

Test for subgroup differences: Not applicable

Analysis 9.2. Comparison 9 CPM + PT vs PT (Follow-up 6 mo), Outcome 2 ROM, Extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 9 CPM + PT vs PT (Follow-up 6 mo)

Outcome: 2 ROM, Extension (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	12	5 (1.24)	7	4 (1.24)		82.4 %	1.00 [-0.16, 2.16]
Kumar 1996	27	3.5 (3.87)	14	0.7 (3.87)		17.6 %	2.80 [0.30, 5.30]
Total (95% CI)	**39**		**21**			**100.0 %**	**1.32 [0.27, 2.37]**

Heterogeneity: Chi² = 1.64, df = 1 (P = 0.20); I² =39%

Test for overall effect: Z = 2.46 (P = 0.014)

Test for subgroup differences: Not applicable

Analysis 10.1. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 1 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

Outcome: 1 ROM, Active flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	9	108 (1.18)	8	107 (1.18)		89.5 %	1.00 [-0.12, 2.12]
MacDonald 2000	40	113 (8)	40	112 (9)		8.1 %	1.00 [-2.73, 4.73]
Pope 1997	20	102 (11.05)	19	100 (11.05)		2.3 %	2.00 [-4.94, 8.94]
Total (95% CI)	**69**		**67**			**100.0 %**	**1.02 [-0.04, 2.09]**

Heterogeneity: Chi² = 0.08, df = 2 (P = 0.96); I² =0.0%

Test for overall effect: Z = 1.89 (P = 0.059)

Test for subgroup differences: Not applicable

Analysis 10.2. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

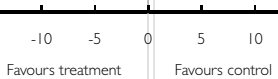
Outcome: 2 Fixed flexion deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	5.3 (4.14)	19	7.1 (4.24)		100.0 %	-1.80 [-4.43, 0.83]
Total (95% CI)	**20**		**19**			**100.0 %**	**-1.80 [-4.43, 0.83]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.34 (P = 0.18)

Test for subgroup differences: Not applicable



Analysis 10.3. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70 = better).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

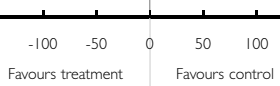
Outcome: 3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70 = better)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	52 (15)	19	52 (11.25)		100.0 %	0.0 [-8.29, 8.29]
Total (95% CI)	**20**		**19**			**100.0 %**	**0.0 [-8.29, 8.29]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable



Analysis 10.4. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 4 ROM, Total (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

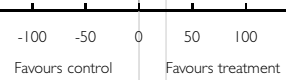
Outcome: 4 ROM, Total (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	20	96.8 (36.89)	19	92.9 (36.89)		100.0 %	3.90 [-19.26, 27.06]
Total (95% CI)	**20**		**19**			**100.0 %**	**3.90 [-19.26, 27.06]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.33 (P = 0.74)

Test for subgroup differences: Not applicable



Analysis 10.5. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 5 ROM, Extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

Outcome: 5 ROM, Extension (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Colwell 1992	9	3 (0)	8	3 (0)			Not estimable
MacDonald 2000	40	2 (2)	40	2 (3)		100.0 %	0.0 [-1.12, 1.12]
Total (95% CI)	**49**		**48**			**100.0 %**	**0.0 [-1.12, 1.12]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable

Analysis 10.6. Comparison 10 CPM + PT vs PT (Follow-up 1yr), Outcome 6 Knee Function (Knee Society Score) (0-200 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 10 CPM + PT vs PT (Follow-up 1yr)

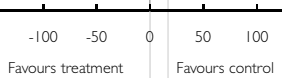
Outcome: 6 Knee Function (Knee Society Score) (0-200 scale)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	166 (23)	40	166 (25)		100.0 %	0.0 [-10.53, 10.53]
Total (95% CI)	**40**		**40**			**100.0 %**	**0.0 [-10.53, 10.53]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable



Analysis 11.1. Comparison 11 CPM + PT vs Splinting (End of treatment 1 wk), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 11 CPM + PT vs Splinting (End of treatment 1 wk)

Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	71 (12)	52	55 (16)		100.0 %	16.00 [10.53, 21.47]
Total (95% CI)	**50**		**52**			**100.0 %**	**16.00 [10.53, 21.47]**

Heterogeneity: not applicable

Test for overall effect: Z = 5.73 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 11.2. Comparison 11 CPM + PT vs Splinting (End of treatment 1 wk), Outcome 2 Extension lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 11 CPM + PT vs Splinting (End of treatment 1 wk)

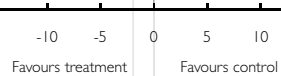
Outcome: 2 Extension lag (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	8 (6)	52	7 (7)		100.0 %	1.00 [-1.53, 3.53]
Total (95% CI)	**50**		**52**			**100.0 %**	**1.00 [-1.53, 3.53]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.78 (P = 0.44)

Test for subgroup differences: Not applicable



Analysis 11.3. Comparison 11 CPM + PT vs Splinting (End of treatment 1 wk), Outcome 3 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 11 CPM + PT vs Splinting (End of treatment 1 wk)

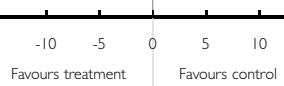
Outcome: 3 Fixed flexion deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	4 (2)	52	4 (3)		100.0 %	0.0 [-0.99, 0.99]
Total (95% CI)	**50**		**52**			**100.0 %**	**0.0 [-0.99, 0.99]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable



Analysis 12.1. Comparison 12 CPM + PT vs Splinting (Follow-up 2 wks), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 12 CPM + PT vs Splinting (Follow-up 2 wks)

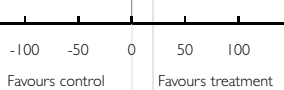
Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	80 (13)	52	70 (16)		100.0 %	10.00 [4.35, 15.65]
Total (95% CI)	**50**		**52**			**100.0 %**	**10.00 [4.35, 15.65]**

Heterogeneity: not applicable

Test for overall effect: Z = 3.47 (P = 0.00052)

Test for subgroup differences: Not applicable

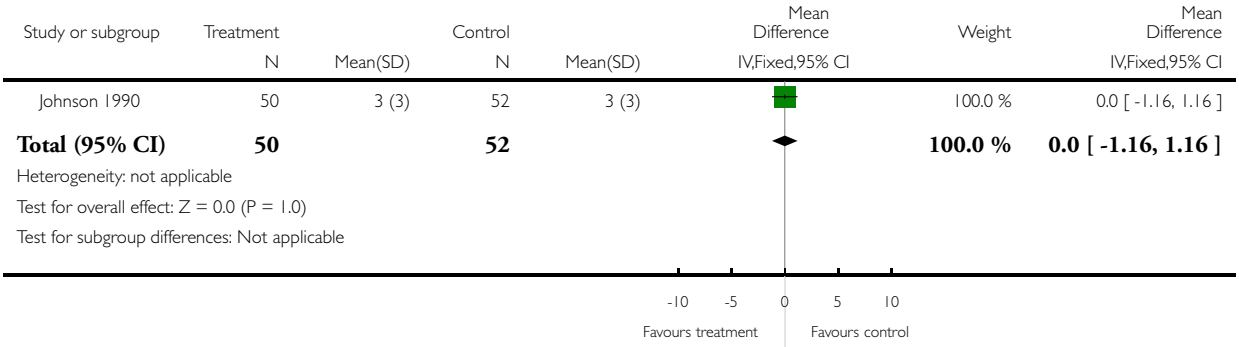


Analysis 12.2. Comparison 12 CPM + PT vs Splinting (Follow-up 2 wks), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 12 CPM + PT vs Splinting (Follow-up 2 wks)

Outcome: 2 Fixed flexion deformity (dgrs)

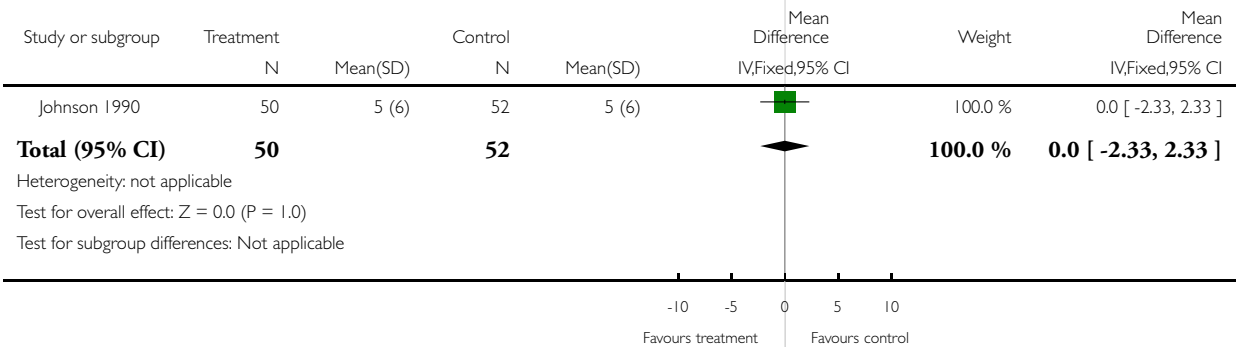


Analysis 12.3. Comparison 12 CPM + PT vs Splinting (Follow-up 2 wks), Outcome 3 Extension lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 12 CPM + PT vs Splinting (Follow-up 2 wks)

Outcome: 3 Extension lag (dgrs)



Analysis 13.1. Comparison 13 CPM + PT vs Splinting (Follow-up 6 wks), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 13 CPM + PT vs Splinting (Follow-up 6 wks)

Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	92 (14)	52	84 (20)		100.0 %	8.00 [1.32, 14.68]
Total (95% CI)	**50**		**52**			**100.0 %**	**8.00 [1.32, 14.68]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.35 (P = 0.019)

Test for subgroup differences: Not applicable

Analysis 13.2. Comparison 13 CPM + PT vs Splinting (Follow-up 6 wks), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 13 CPM + PT vs Splinting (Follow-up 6 wks)

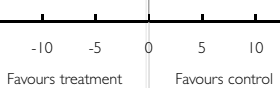
Outcome: 2 Fixed flexion deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	4 (3)	52	3 (3)		100.0 %	1.00 [-0.16, 2.16]
Total (95% CI)	**50**		**52**			**100.0 %**	**1.00 [-0.16, 2.16]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.68 (P = 0.092)

Test for subgroup differences: Not applicable



Analysis 13.3. Comparison 13 CPM + PT vs Splinting (Follow-up 6 wks), Outcome 3 Extension lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 13 CPM + PT vs Splinting (Follow-up 6 wks)

Outcome: 3 Extension lag (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	2 (3)	52	3 (7)		100.0 %	-1.00 [-3.08, 1.08]
Total (95% CI)	**50**		**52**			**100.0 %**	**-1.00 [-3.08, 1.08]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.94 (P = 0.35)

Test for subgroup differences: Not applicable

Analysis 14.1. Comparison 14 CPM + PT vs Splinting (Follow-up 3 mo), Outcome 1 ROM, flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 14 CPM + PT vs Splinting (Follow-up 3 mo)

Outcome: 1 ROM, flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	101 (15)	52	96 (14)		100.0 %	5.00 [-0.64, 10.64]
Total (95% CI)	**50**		**52**			**100.0 %**	**5.00 [-0.64, 10.64]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.74 (P = 0.082)

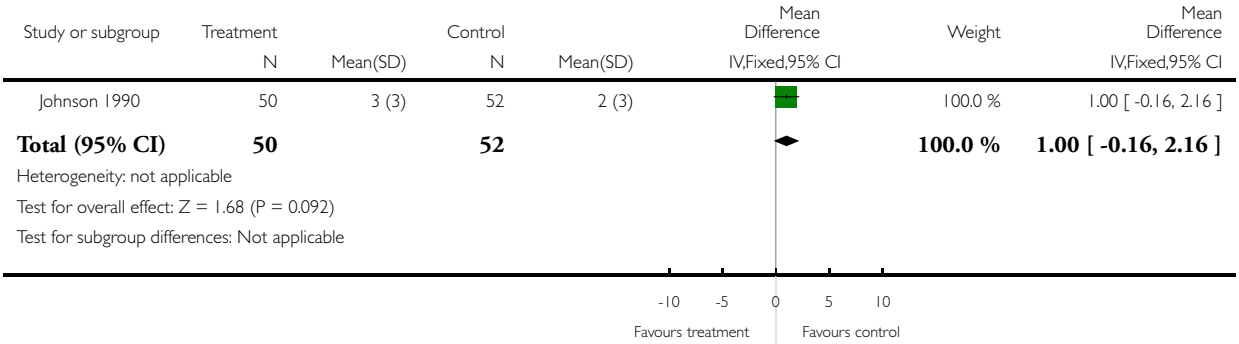
Test for subgroup differences: Not applicable

Analysis 14.2. Comparison 14 CPM + PT vs Splinting (Follow-up 3 mo), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 14 CPM + PT vs Splinting (Follow-up 3 mo)

Outcome: 2 Fixed flexion deformity (dgrs)

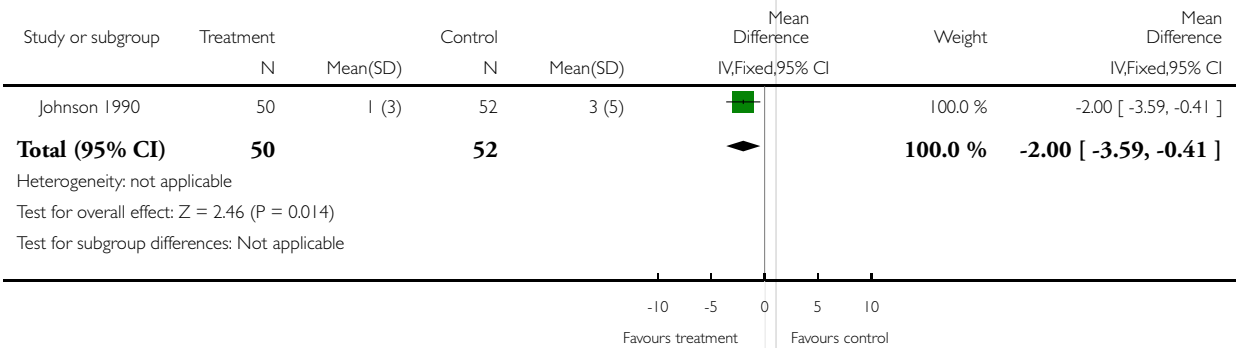


Analysis 14.3. Comparison 14 CPM + PT vs Splinting (Follow-up 3 mo), Outcome 3 Extension lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 14 CPM + PT vs Splinting (Follow-up 3 mo)

Outcome: 3 Extension lag (dgrs)



Analysis 15.1. Comparison 15 CPM + PT vs Splinting (Follow-up 6 mo), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 15 CPM + PT vs Splinting (Follow-up 6 mo)

Outcome: 1 ROM, Flexion (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	100 (16)	52	93 (17)		100.0 %	7.00 [0.60, 13.40]
Total (95% CI)	**50**		**52**			**100.0 %**	**7.00 [0.60, 13.40]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.14 (P = 0.032)

Test for subgroup differences: Not applicable

Analysis 15.2. Comparison 15 CPM + PT vs Splinting (Follow-up 6 mo), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 15 CPM + PT vs Splinting (Follow-up 6 mo)

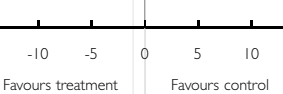
Outcome: 2 Fixed flexion deformity (dgrs)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Johnson 1990	50	2 (3)	52	2 (3)		100.0 %	0.0 [-1.16, 1.16]
Total (95% CI)	**50**		**52**			**100.0 %**	**0.0 [-1.16, 1.16]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable

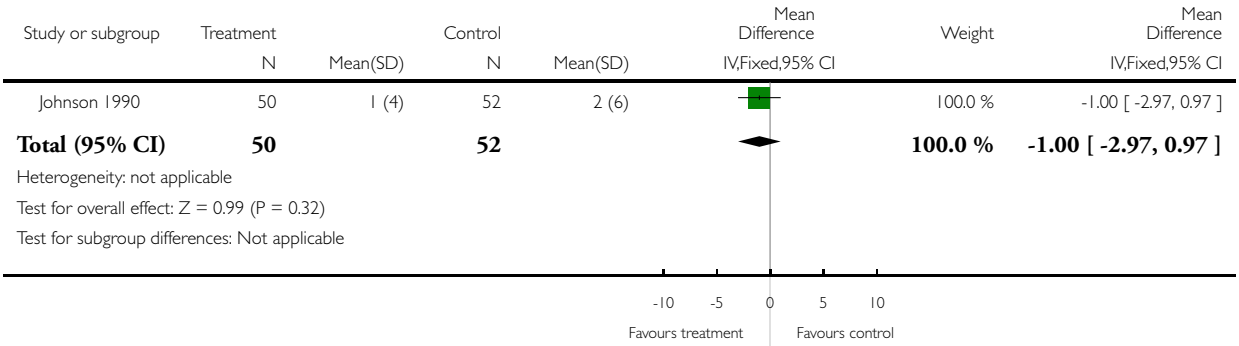


Analysis 15.3. Comparison 15 CPM + PT vs Splinting (Follow-up 6 mo), Outcome 3 Extension lag (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 15 CPM + PT vs Splinting (Follow-up 6 mo)

Outcome: 3 Extension lag (dgrs)

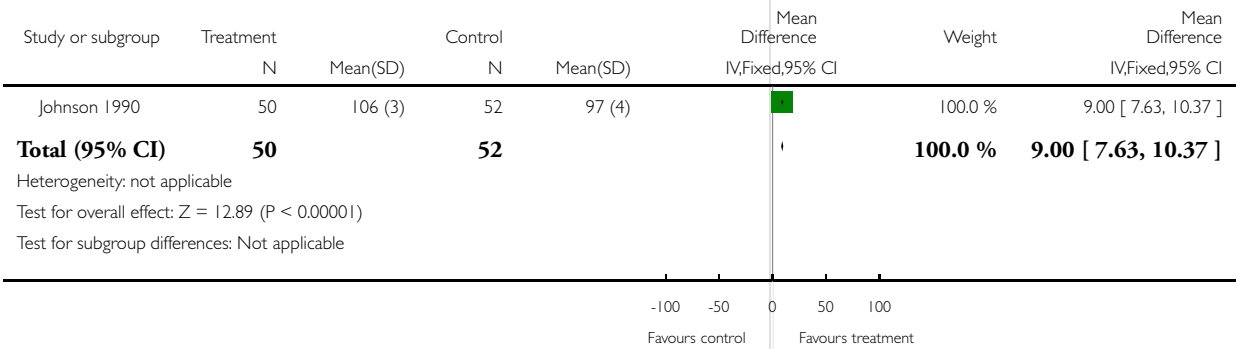


Analysis 16.1. Comparison 16 CPM + PT vs Splinting (Follow-up 1yr), Outcome 1 ROM, Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 16 CPM + PT vs Splinting (Follow-up 1yr)

Outcome: 1 ROM, Flexion (dgrs)

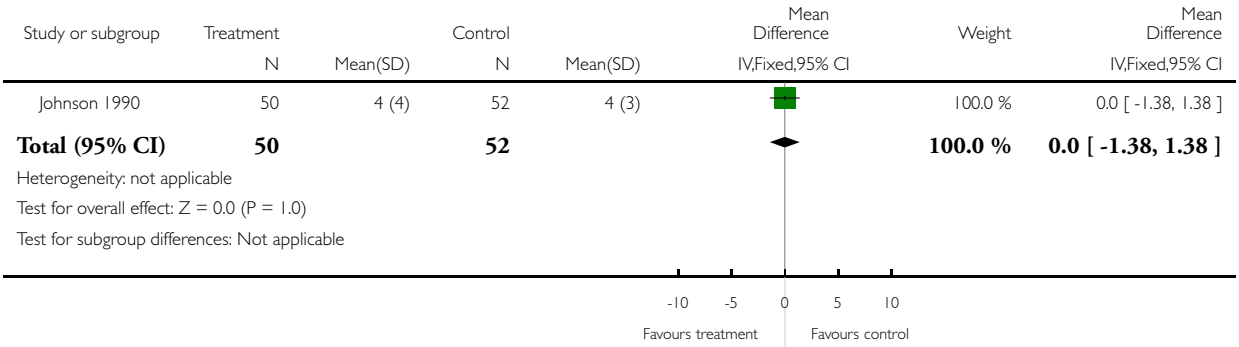


Analysis 16.2. Comparison 16 CPM + PT vs Splinting (Follow-up 1yr), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 16 CPM + PT vs Splinting (Follow-up 1yr)

Outcome: 2 Fixed flexion deformity (dgrs)

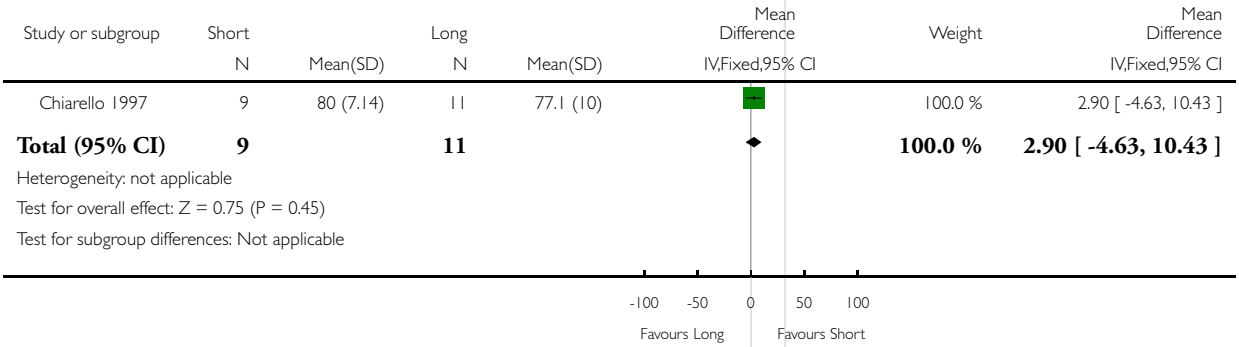


Analysis 18.1. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 1 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome: 1 ROM, Active flexion (dgrs)

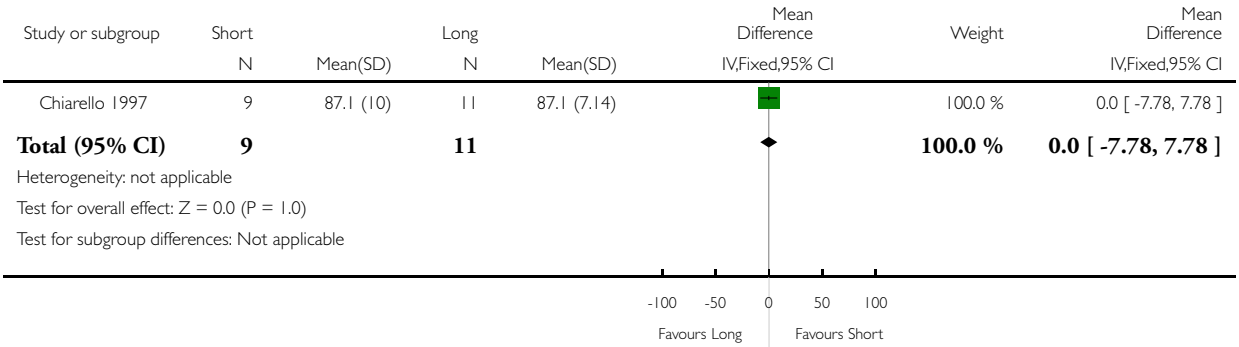


Analysis 18.2. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 2 ROM, Passive flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome: 2 ROM, Passive flexion (dgrs)

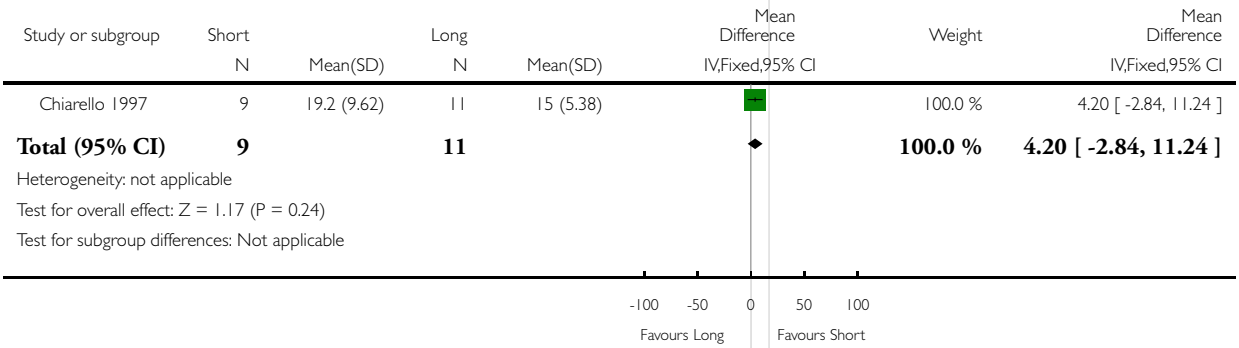


Analysis 18.3. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 3 ROM, Active extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome: 3 ROM, Active extension (dgrs)



Analysis 18.4. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 4 ROM, Passive extension (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

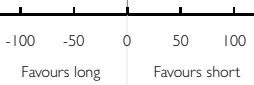
Outcome: 4 ROM, Passive extension (dgrs)

Study or subgroup	Short N	Mean(SD)	Long N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	9	5 (5.77)	11	6.2 (5.38)		100.0 %	-1.20 [-6.13, 3.73]
Total (95% CI)	**9**		**11**			**100.0 %**	**-1.20 [-6.13, 3.73]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.48 (P = 0.63)

Test for subgroup differences: Not applicable



Analysis 18.5. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 5 Rate of change in passive flexion (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome: 5 Rate of change in passive flexion (dgrs/day)

Study or subgroup	Short N	Mean(SD)	Long N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	9	3.7 (1.1)	11	3.9 (2.4)		100.0 %	-0.20 [-1.79, 1.39]
Total (95% CI)	**9**		**11**			**100.0 %**	**-0.20 [-1.79, 1.39]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.25 (P = 0.81)

Test for subgroup differences: Not applicable

Analysis 18.6. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 6 Rate of change in active flexion (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

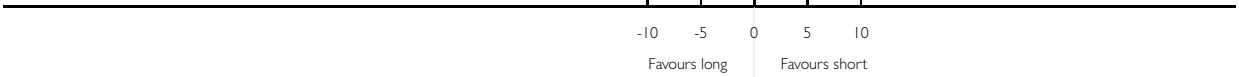
Outcome: 6 Rate of change in active flexion (dgrs/day)

Study or subgroup	Short N	Mean(SD)	Long N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	9	2.7 (1.6)	11	4.1 (3.7)		100.0 %	-1.40 [-3.82, 1.02]
Total (95% CI)	**9**		**11**			**100.0 %**	**-1.40 [-3.82, 1.02]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.13 (P = 0.26)

Test for subgroup differences: Not applicable



Analysis 18.7. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 7 Rate of change in passive extension (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

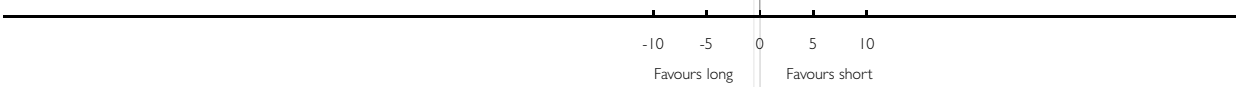
Outcome: 7 Rate of change in passive extension (dgrs/day)

Study or subgroup	Short N	Mean(SD)	Long N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Chiarello 1997	9	0.8 (0.7)	11	0.71 (1.4)		100.0 %	0.09 [-0.86, 1.04]
Total (95% CI)	**9**		**11**			**100.0 %**	**0.09 [-0.86, 1.04]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.19 (P = 0.85)

Test for subgroup differences: Not applicable

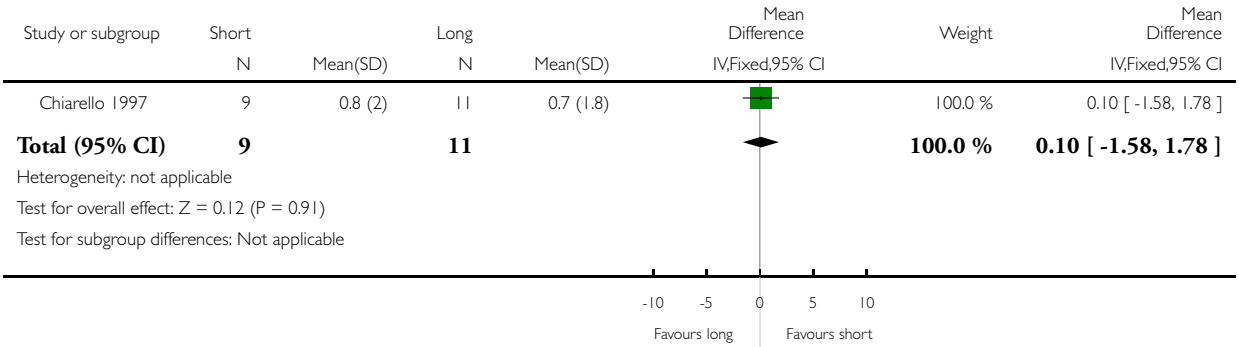


Analysis 18.8. Comparison 18 Short time CPM vs long time CPM (End of treatment 2 wks), Outcome 8 Rate of change in active extension (dgrs/day).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 18 Short time CPM vs long time CPM (End of treatment 2 wks)

Outcome: 8 Rate of change in active extension (dgrs/day)

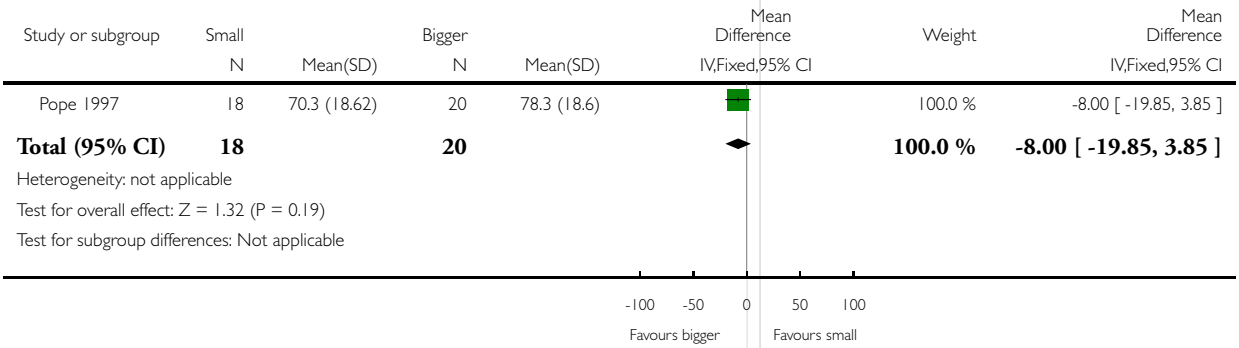


Analysis 19.1. Comparison 19 Small range CPM vs Bigger range CPM (Follow-up 1wk), Outcome 1 ROM, Active flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 19 Small range CPM vs Bigger range CPM (Follow-up 1wk)

Outcome: 1 ROM, Active flexion (dgrs)



Analysis 19.2. Comparison 19 Small range CPM vs Bigger range CPM (Follow-up 1wk), Outcome 2 ROM, Total (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 19 Small range CPM vs Bigger range CPM (Follow-up 1wk)

Outcome: 2 ROM, Total (dgrs)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	58.6 (20.13)	20	69.5 (20.08)		100.0 %	-10.90 [-23.70, 1.90]
Total (95% CI)	**18**		**20**			**100.0 %**	**-10.90 [-23.70, 1.90]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.67 (P = 0.095)

Test for subgroup differences: Not applicable

Analysis 19.3. Comparison 19 Small range CPM vs Bigger range CPM (Follow-up 1wk), Outcome 3 Analgesic Use (mg morphine).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 19 Small range CPM vs Bigger range CPM (Follow-up 1wk)

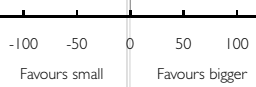
Outcome: 3 Analgesic Use (mg morphine)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	72.6 (10.15)	20	81.5 (10.15)		100.0 %	-8.90 [-15.36, -2.44]
Total (95% CI)	**18**		**20**			**100.0 %**	**-8.90 [-15.36, -2.44]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.70 (P = 0.0070)

Test for subgroup differences: Not applicable



Analysis 19.4. Comparison 19 Small range CPM vs Bigger range CPM (Follow-up 1wk), Outcome 4 Flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 19 Small range CPM vs Bigger range CPM (Follow-up 1wk)

Outcome: 4 Flexion deformity (dgrs)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	11.3 (7.36)	20	8.2 (8.44)		100.0 %	3.10 [-1.92, 8.12]
Total (95% CI)	**18**		**20**			**100.0 %**	**3.10 [-1.92, 8.12]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.21 (P = 0.23)

Test for subgroup differences: Not applicable

Analysis 20.1. Comparison 20 Small range CPM vs Bigger range CPM (Follow-up 1yr), Outcome 1 ROM, Active Flexion (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 20 Small range CPM vs Bigger range CPM (Follow-up 1yr)

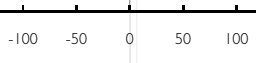
Outcome: 1 ROM, Active Flexion (dgrs)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	103.8 (12.88)	20	102 (12.88)		100.0 %	1.80 [-6.40, 10.00]
Total (95% CI)	**18**		**20**			**100.0 %**	**1.80 [-6.40, 10.00]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.43 (P = 0.67)

Test for subgroup differences: Not applicable



Analysis 20.2. Comparison 20 Small range CPM vs Bigger range CPM (Follow-up 1yr), Outcome 2 Fixed flexion deformity (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 20 Small range CPM vs Bigger range CPM (Follow-up 1yr)

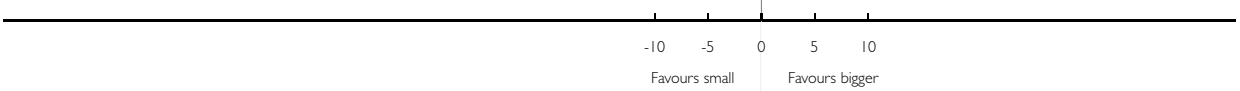
Outcome: 2 Fixed flexion deformity (dgrs)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	6.9 (4.93)	20	5.3 (4.93)		100.0 %	1.60 [-1.54, 4.74]
Total (95% CI)	**18**		**20**			**100.0 %**	**1.60 [-1.54, 4.74]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.00 (P = 0.32)

Test for subgroup differences: Not applicable



Analysis 20.3. Comparison 20 Small range CPM vs Bigger range CPM (Follow-up 1yr), Outcome 3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70=better).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 20 Small range CPM vs Bigger range CPM (Follow-up 1yr)

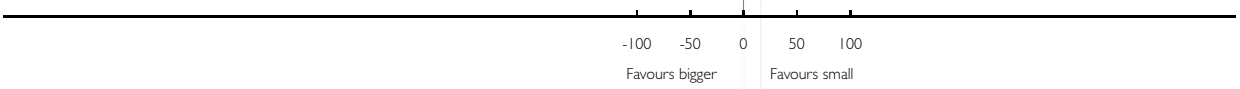
Outcome: 3 Function (Mobility, walking aids, pain disability; 0-70 scale, 70=better)

Study or subgroup	Small N	Mean(SD)	Bigger N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Pope 1997	18	56 (49.25)	20	52 (49.25)		100.0 %	4.00 [-27.36, 35.36]
Total (95% CI)	**18**		**20**			**100.0 %**	**4.00 [-27.36, 35.36]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.25 (P = 0.80)

Test for subgroup differences: Not applicable

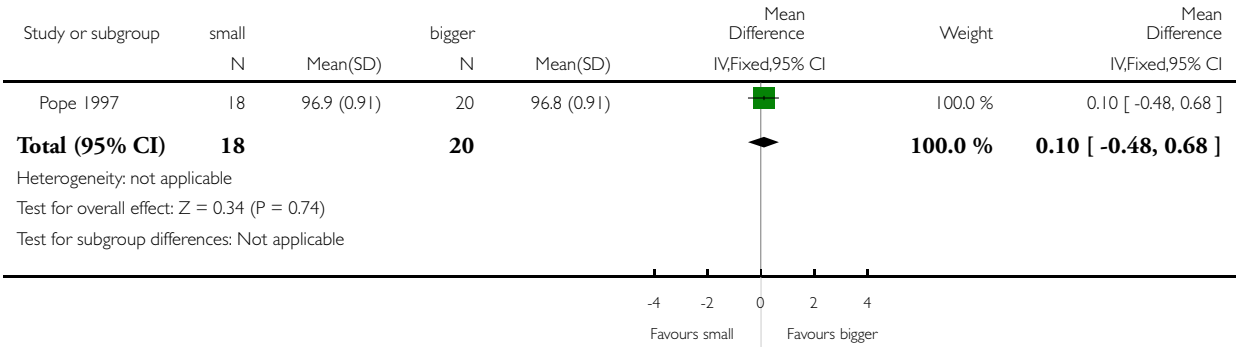


Analysis 20.4. Comparison 20 Small range CPM vs Bigger range CPM (Follow-up 1yr), Outcome 4 ROM, Total (dgrs).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 20 Small range CPM vs Bigger range CPM (Follow-up 1yr)

Outcome: 4 ROM, Total (dgrs)

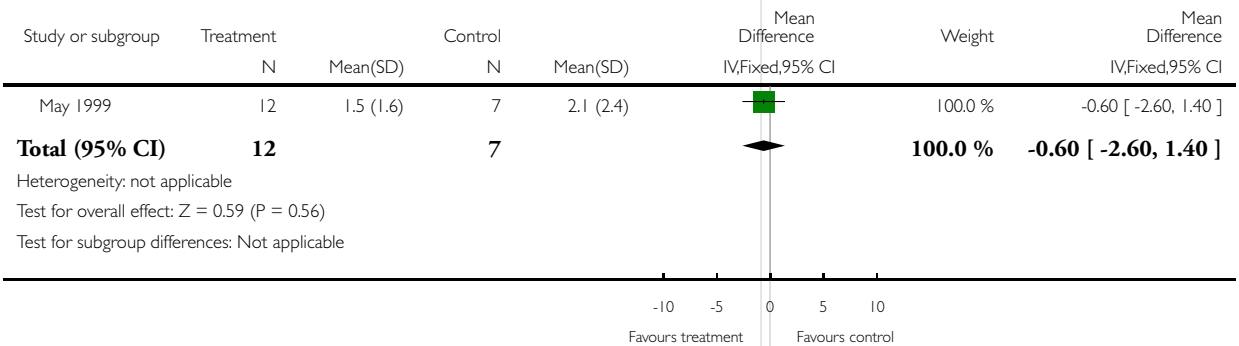


Analysis 21.1. Comparison 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo), Outcome 1 Pain (VAS 0-10 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

Outcome: 1 Pain (VAS 0-10 scale)

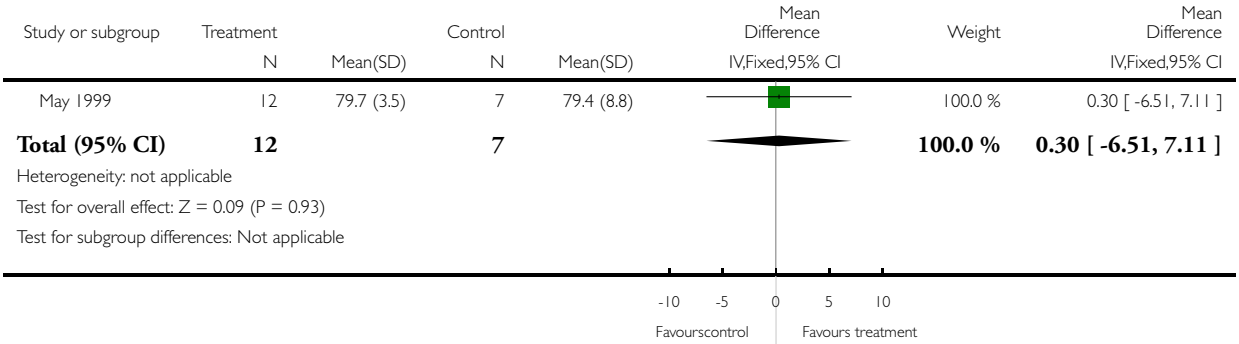


Analysis 21.2. Comparison 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo), Outcome 2 ROM - Active Knee Flexion (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

Outcome: 2 ROM - Active Knee Flexion (degrees)

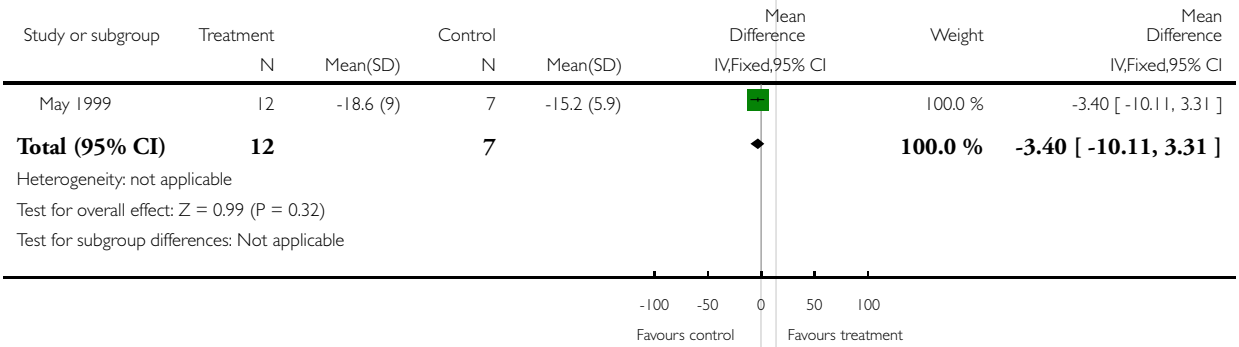


Analysis 21.3. Comparison 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo), Outcome 3 ROM - Active Knee Extension (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

Outcome: 3 ROM - Active Knee Extension (degrees)



Analysis 21.4. Comparison 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo), Outcome 4 ROM - Passive Knee Extension (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

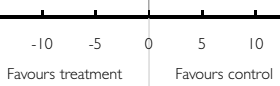
Outcome: 4 ROM - Passive Knee Extension (degrees)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
May 1999	12	-10.1 (6.4)	7	-10.3 (3.8)		100.0 %	0.20 [-4.39, 4.79]
Total (95% CI)	**12**		**7**			**100.0 %**	**0.20 [-4.39, 4.79]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.09 (P = 0.93)

Test for subgroup differences: Not applicable



Analysis 21.5. Comparison 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo), Outcome 5 Walking Time for 10m (s).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 21 CPM vs Lower Limb Mobility Board (End of Treatment 1 mo)

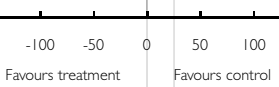
Outcome: 5 Walking Time for 10m (s)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
May 1999	12	35.6 (41.8)	7	24.1 (18.2)		100.0 %	11.50 [-15.72, 38.72]
Total (95% CI)	**12**		**7**			**100.0 %**	**11.50 [-15.72, 38.72]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.83 (P = 0.41)

Test for subgroup differences: Not applicable



Analysis 22.1. Comparison 22 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up approx. 1 wk), Outcome 1 Pain (analgesic use) (mg).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 22 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up approx. 1 wk)

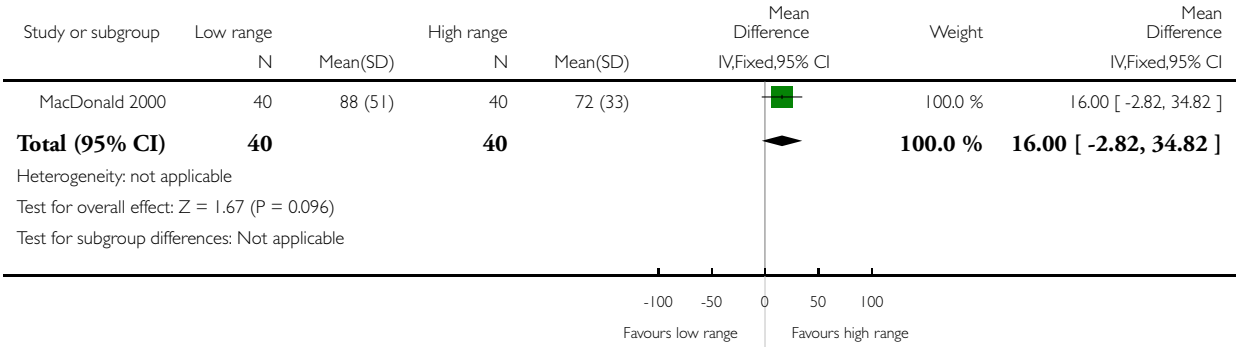
Outcome: 1 Pain (analgesic use) (mg)

Study or subgroup	Low range N	Mean(SD)	High range N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	88 (51)	40	72 (33)		100.0 %	16.00 [-2.82, 34.82]
Total (95% CI)	**40**		**40**			**100.0 %**	**16.00 [-2.82, 34.82]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.67 (P = 0.096)

Test for subgroup differences: Not applicable



Analysis 22.2. Comparison 22 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up approx. 1 wk), Outcome 2 Length of stay (days).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 22 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up approx. 1 wk)

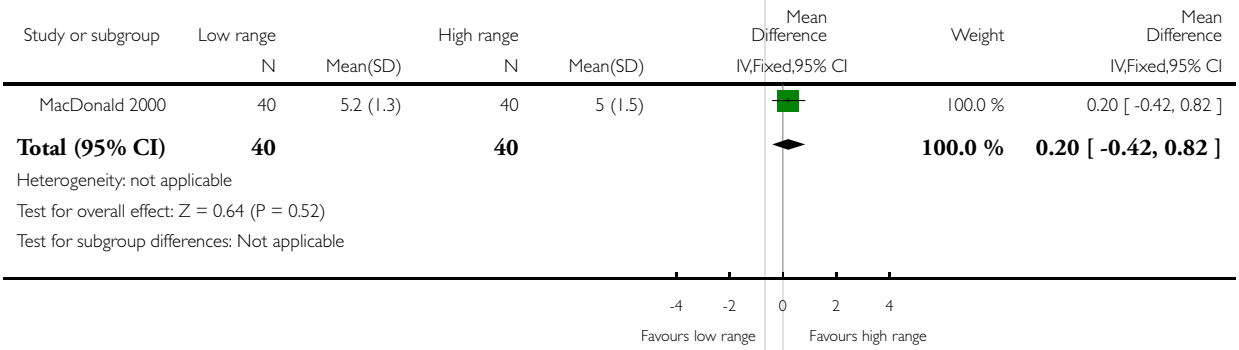
Outcome: 2 Length of stay (days)

Study or subgroup	Low range N	Mean(SD)	High range N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	5.2 (1.3)	40	5 (1.5)		100.0 %	0.20 [-0.42, 0.82]
Total (95% CI)	**40**		**40**			**100.0 %**	**0.20 [-0.42, 0.82]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.64 (P = 0.52)

Test for subgroup differences: Not applicable

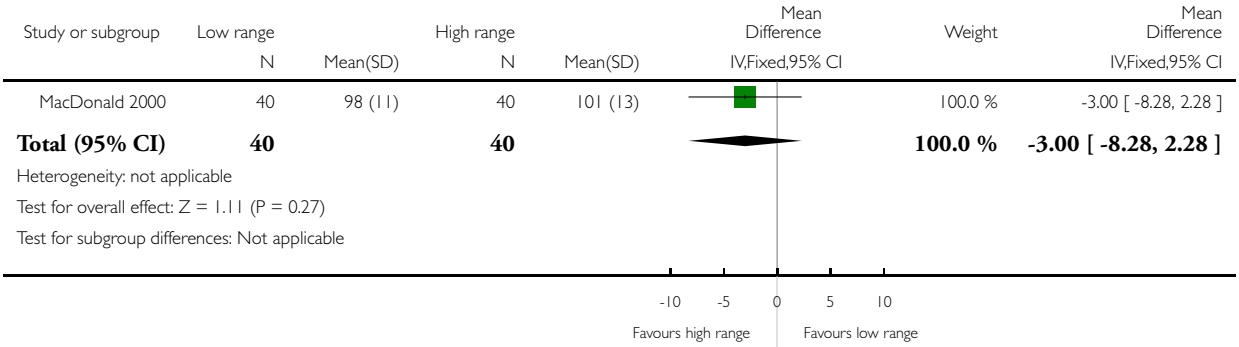


Analysis 23.1. Comparison 23 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 6 wks), Outcome 1 ROM - Knee flexion (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 23 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up 6 wks)

Outcome: 1 ROM - Knee flexion (degrees)

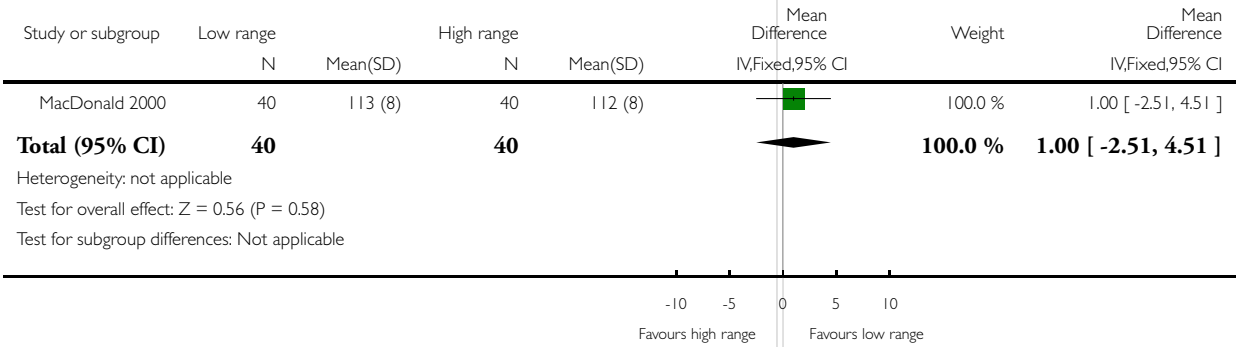


Analysis 24.1. Comparison 24 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 1 yr), Outcome 1 ROM - Knee flexion (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 24 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up 1 yr)

Outcome: 1 ROM - Knee flexion (degrees)



Analysis 24.2. Comparison 24 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 1 yr), Outcome 2 ROM - Knee extension (degrees).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 24 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up 1 yr)

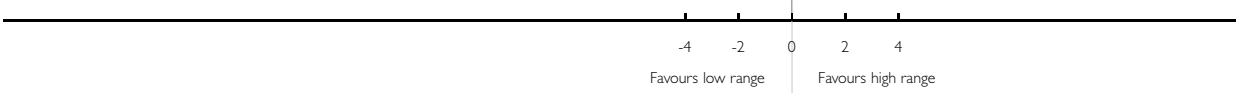
Outcome: 2 ROM - Knee extension (degrees)

Study or subgroup	Low range N	Mean(SD)	High range N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	2 (2)	40	2 (2)		100.0 %	0.0 [-0.88, 0.88]
Total (95% CI)	**40**		**40**			**100.0 %**	**0.0 [-0.88, 0.88]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.0 (P = 1.0)

Test for subgroup differences: Not applicable



Analysis 24.3. Comparison 24 Low range CPM (0°-50°) vs High range CPM (70°-110°) (Follow-up 1 yr), Outcome 3 Knee Funciton (Knee Society Score) (0-200 scale).

Review: Continuous passive motion following total knee arthroplasty

Comparison: 24 Low range CPM (0 -50) vs High range CPM (70 -110) (Follow-up 1 yr)

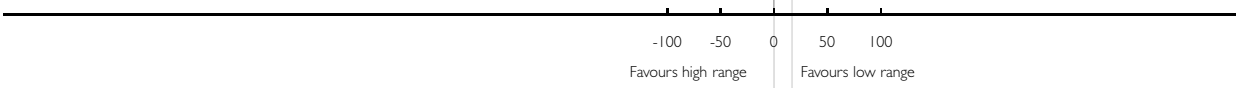
Outcome: 3 Knee Funciton (Knee Society Score) (0-200 scale)

Study or subgroup	Low range N	Mean(SD)	High range N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
MacDonald 2000	40	166 (23)	40	165 (18)		100.0 %	1.00 [-8.05, 10.05]
Total (95% CI)	**40**		**40**			**100.0 %**	**1.00 [-8.05, 10.05]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.22 (P = 0.83)

Test for subgroup differences: Not applicable



APPENDICES

Appendix 1. Full search strategy

1 exp arthritis, rheumatoid/
2 arthritis, juvenile rheumatoid/
3 1 not 2
4 (rheumat$ adj arthrit$).tw.
5 3 or 4
6 osteoarthritis, knee/
7 osteoarthritis/
8 osteoarthritis.tw.
9 knee.tw,hw.
10 7 or 8
11 9 and 10
12 6 or 11
13 5 or 12
14 arthroplasty, replacement, knee/
15 knee prosthesis/
16 total knee.tw.
17 or/14-16
18 exp physical therapy/
19 motion therapy, continuous passive/
20 continuous passive motion.tw.
21 gait therapy.tw.
22 exercise therapy.tw.
23 (ice or cold).tw.
24 therapeutic exercise/
25 "heat/cold application"/
26 or/18-25
27 17 and 26
28 random$.tw.
29 control$.tw.
30 (compare or comparative).tw.
31 experiment$.tw.
32 exp clinical trials/
33 comparative studies/
34 exp prospective studies/
35 prospective.tw.
36 retrospective.tw.
37 cross-section$.tw.
38 cross sectional studies/
39 exp case control studies/
40 or/28-39
41 27 and 40
42 27 not 41

WHAT'S NEW

Last assessed as up-to-date: 23 February 2003.

Date	Event	Description
25 July 2008	Amended	Converted to new review format. CMSG ID: C019-R

HISTORY

Review first published: Issue 2, 2003

CONTRIBUTIONS OF AUTHORS

SEM was responsible for writing the manuscript, extracting and analyzing data and selecting trials of the initial review.

LB contributed data extraction, update of the selection of the reference list, update of the analyses and update of the interpretation of results.

VW provided an update of the analyses and aided in the interpretation of results

GW and PT contributed methodological expertise and commented on early drafts.

MJN contributed to the data extraction, analysis and selection trials.

HD contributed to the data extraction, analysis and selection trials.

JD contributed to the data extraction, analysis and selection trials.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- The University of Ottawa, Canada.

External sources

- No sources of support supplied

INDEX TERMS

Medical Subject Headings (MeSH)

*Motion Therapy, Continuous Passive; Arthroplasty, Replacement, Knee [*rehabilitation]; Randomized Controlled Trials as Topic; Range of Motion, Articular

MeSH check words

Humans