***Supplementary Materials***

**Table S1-S4**: Search strategy.

**Table S5-S22**: Sensitivity analyses.

**Table S23**: Publication bias.

**Table S24-S31**: Evidence quality assessment according to GRADE.

|  |
| --- |
| **Table S1 Search strategy in PubMed** |
| #1 | (((((((((((((((((((((Arthroplasty, Replacement, Knee[MeSH Terms]) OR (Total knee arthroplasty[Title/Abstract])) OR (Total knee replacement[Title/Abstract])) OR (Knee replacement[Title/Abstract])) OR (Knee arthroplasty[Title/Abstract])) OR (TKA[Title/Abstract])) OR (TKR[Title/Abstract])) OR (Arthroplasties, Replacement, Knee[Title/Abstract])) OR (Arthroplasty, Knee Replacement[Title/Abstract])) OR (Knee Replacement Arthroplasties[Title/Abstract])) OR (Knee Replacement Arthroplasty[Title/Abstract])) OR (Replacement Arthroplasties, Knee[Title/Abstract])) OR (Knee Arthroplasty, Total[Title/Abstract])) OR (Arthroplasty, Total Knee[Title/Abstract])) OR (Total Knee Arthroplasty[Title/Abstract])) OR (Replacement, Total Knee[Title/Abstract])) OR (Total Knee Replacement[Title/Abstract])) OR (Knee Replacement, Total[Title/Abstract])) OR (Knee Arthroplasty[Title/Abstract])) OR (Arthroplasty, Knee[Title/Abstract])) OR (Arthroplasties, Knee Replacement[Title/Abstract])) OR (Replacement Arthroplasty, Knee[Title/Abstract]) | 39,945 |
| #2 | ((((((((((((((((((((((((((((((((((((((((((((((((((Resistance Training[MeSH Terms]) OR (Strength training[MeSH Terms])) OR (Strengthening exercise[MeSH Terms])) OR (Muscle strengthening[MeSH Terms])) OR (Muscle strength training[MeSH Terms])) OR (Muscle strength exercise[MeSH Terms])) OR (Muscle exercise[MeSH Terms])) OR (Muscle training[MeSH Terms])) OR (Resistance exercise[MeSH Terms])) OR (Quadriceps training[MeSH Terms])) OR (Quadriceps exercise[MeSH Terms])) OR (Preoperative exercise[MeSH Terms])) OR (Preoperative training[MeSH Terms])) OR (Strength training[Title/Abstract])) OR (Strengthening exercise[Title/Abstract])) OR (Muscle strengthening[Title/Abstract])) OR (Muscle strength training[Title/Abstract])) OR (Muscle strength exercise[Title/Abstract])) OR (Muscle exercise[Title/Abstract])) OR (Muscle training[Title/Abstract])) OR (Resistance training[Title/Abstract])) OR (Resistance exercise[Title/Abstract])) OR (Quadriceps training[Title/Abstract])) OR (Quadriceps exercise[Title/Abstract])) OR (Preoperative exercise[Title/Abstract])) OR (Preoperative training[Title/Abstract])) OR (Strengthening Program[Title/Abstract])) OR (Exercise Program[Title/Abstract])) OR (Preoperative rehabilitation[Title/Abstract])) OR (Weight bearing[Title/Abstract])) OR (Weight lifting[Title/Abstract])) OR (Weight training[Title/Abstract])) OR (Weight exercise[Title/Abstract])) OR (Weight program[Title/Abstract])) OR (Isokinetic training[Title/Abstract])) OR (Isokinetic exercise[Title/Abstract])) OR (Isokinetic program[Title/Abstract])) OR (Isometric training[Title/Abstract])) OR (Isometric exercise[Title/Abstract])) OR (Isometric program[Title/Abstract])) OR (Isometric contraction[Title/Abstract])) OR (Isotonic contraction[Title/Abstract])) OR (Eccentric contraction[Title/Abstract])) OR (Concentric contraction[Title/Abstract])) OR (Eccentric exercise[Title/Abstract])) OR (Concentric exercise[Title/Abstract])) OR (Resistance program[Title/Abstract])) OR (Strength program[Title/Abstract])) OR (Strength exercise[Title/Abstract])) OR (Strength training[Title/Abstract])) OR (Prehabilitation[Title/Abstract]) | 112,023 |
| #3 | (((((((Randomized Controlled Trial [Publication Type] ) OR (Clinical Trial [Publication Type] )) OR (Randomly [Title/Abstract] )) OR (Random [Title/Abstract] )) OR (Randomized [Title/Abstract] )) OR (Trial [Title/Abstract] )) OR (Control [Title/Abstract] )) OR (Controlled [Title/Abstract] ) | 4,701,176 |
| #4 | #1 AND #2 AND #3 | 453 |

|  |
| --- |
| **Table S2 Search strategy in EMBASE** |
| #1 | 'total knee arthroplasty'/exp OR 'knee arthroplasty'/exp OR 'knee replacement'/exp OR 'total knee replacement':ab,ti OR 'total knee arthroplasty':ab,ti OR 'knee replacement':ab,ti OR 'knee arthroplasty':ab,ti OR 'tka':ab,ti OR 'tkr':ab,ti | 55,265 |
| #2 | 'resistance training'/exp OR 'muscle training'/exp OR 'muscle exercise'/exp OR 'resistance training':ab,ti OR 'strength training':ab,ti OR 'strengthening exercise':ab,ti OR 'muscle strengthening':ab,ti OR 'muscle strength training':ab,ti OR 'muscle strength exercise':ab,ti OR 'muscle exercise':ab,ti OR 'resistance training':ab,ti OR 'resistance exercise':ab,ti OR 'quadriceps training':ab,ti OR 'quadriceps exercise':ab,ti OR 'preoperative exercise':ab,ti OR 'preoperative training':ab,ti OR 'strengthening program':ab,ti OR 'exercise program':ab,ti OR 'muscle training':ab,ti OR 'Preoperative rehabilitation':ab,ti OR 'Weight bearing':ab,ti OR 'Weight lifting':ab,ti OR 'Weight training':ab,ti OR 'Weight exercise':ab,ti OR 'Weight program':ab,ti OR 'Isokinetic training':ab,ti OR 'Isokinetic exercise':ab,ti OR 'Isokinetic program':ab,ti OR 'Isometric training':ab,ti OR 'Isometric exercise':ab,ti OR 'Isometric program':ab,ti OR 'Isometric contraction':ab,ti OR 'Isotonic contraction':ab,ti OR 'Eccentric contraction':ab,ti OR 'Concentric contraction':ab,ti OR 'Eccentric exercise':ab,ti OR 'Concentric exercise':ab,ti OR 'Resistance program':ab,ti OR 'Strength program':ab,ti OR 'Strength exercise':ab,ti OR 'Strength training':ab,ti OR 'Prehabilitation':ab,ti OR 'Exercise therapy':ab,ti | 102,824 |
| #3 | 'randomized controlled trial'/exp | 686,585 |
| #4 | #1 AND #2 AND #3 | 230 |

|  |
| --- |
| **Table S3 Search strategy in Cochrane Library** |
| #1 | MeSH descriptor: [Arthroplasty, Replacement, Knee] explode all trees OR ("Total knee arthroplasty"):ti,ab,kw OR ("Total knee replacement"):ti,ab,kw OR ("Knee replacement"):ti,ab,kw OR ("Knee arthroplasty"):ti,ab,kw OR ("TKA"):ti,ab,kw OR ("TKR"):ti,ab,kw | 8,698 |
| #2 | MeSH descriptor: [Resistance Training] explode all trees OR MeSH descriptor: [Preoperative Exercise] explode all trees OR ("Resistance Training"):ti,ab,kw OR ("Strength training"):ti,ab,kw OR ("Strengthening exercise"):ti,ab,kw OR ("Muscle strengthening"):ti,ab,kw OR ("Muscle strength training"):ti,ab,kw OR ("Muscle strength exercise"):ti,ab,kw OR ("Muscle exercise"):ti,ab,kw OR ("Muscle training"):ti,ab,kw OR ("Resistance exercise"):ti,ab,kw OR ("Resistance training"):ti,ab,kw OR ("Quadriceps training"):ti,ab,kw OR ("Quadriceps exercise"):ti,ab,kw OR ("Preoperative exercise"):ti,ab,kw OR ("Preoperative training"):ti,ab,kw ("Preoperative rehabilitation"):ti,ab,kw OR ("Weight bearing"):ti,ab,kw OR ("Weight lifting"):ti,ab,kw OR ("Weight training"):ti,ab,kw OR ("Weight exercise"):ti,ab,kw OR ("Weight program"):ti,ab,kw OR ("Isokinetic training"):ti,ab,kw OR ("Isokinetic exercise"):ti,ab,kw OR ("Isokinetic program"):ti,ab,kw OR ("Isometric training"):ti,ab,kw OR ("Isometric exercise"):ti,ab,kw OR ("Isometric program"):ti,ab,kw OR ("Isometric contraction"):ti,ab,kw OR ("Isotonic contraction"):ti,ab,kw OR ("Eccentric contraction"):ti,ab,kw OR ("Concentric contraction"):ti,ab,kw OR ("Eccentric exercise"):ti,ab,kw OR ("Concentric exercise"):ti,ab,kw OR ("Resistance program"):ti,ab,kw OR ("Strength program"):ti,ab,kw OR ("Strength exercise"):ti,ab,kw OR ("Strength training"):ti,ab,kw OR ("Prehabilitation"):ti,ab,kw OR ("Exercise therapy"):ti,ab,kw | 37,276 |
| #3 | #1 AND #2 | 561 |

|  |
| --- |
| **Table S4 Search strategy in Web of Science** |
| #1 | TS=Total knee arthroplasty OR TS=Total knee replacement OR TS=Knee replacement OR TS=Knee arthroplasty OR TS=TKA OR TI=TKR OR AB=TKR OR AB=TKA OR TI=Total knee arthroplasty OR TI=Total knee replacement OR TI=Knee replacement OR TI=Knee arthroplasty | 65,281 |
| #2 | TS=Resistance Training OR TS=Strength training OR TS=Strengthening exercise OR TS=Muscle strengthening OR TS=Muscle strength training OR TS=Muscle strength exercise OR TS=Muscle exercise OR TS=Muscle training OR TS=Resistance exercise OR TS=Quadriceps training OR TS=Quadriceps exercise OR TI=Resistance Training OR TI=Strength training OR TI=Strengthening exercise OR TI=Muscle strengthening OR TI=Muscle strength training OR TI=Muscle strength exercise OR TI=Muscle exercise OR TI=Muscle training OR TI=Resistance exercise OR TI=Quadriceps training OR TI=Quadriceps exercise OR TS=Preoperative rehabilitation OR TI=Preoperative rehabilitation OR TS=Weight bearing OR TI=Weight bearing OR TS=Weight lifting OR TI=Weight lifting OR TS=Weight training OR TI=Weight training OR TS=Weight exercise OR TI=Weight exercise OR TS=Weight program OR TI=Weight program OR TS=Isokinetic training OR TI=Isokinetic training OR TS=Isokinetic exercise OR TI=Isokinetic exercise OR TS=Isokinetic program OR TI=Isokinetic program OR TS=Isometric training OR TI=Isometric training OR TS=Isometric exercise OR TI=Isometric exercise OR TS=Isometric program OR TI=Isometric program OR TS=Isometric contraction OR TI=Isometric contraction OR TS=Isotonic contraction OR TI=Isotonic contraction OR TS=Eccentric contraction OR TI=Eccentric contraction OR TS=Concentric contraction OR TI=Concentric contraction OR TS=Eccentric exercise OR TI=Eccentric exercise OR TS=Concentric exercise OR TI=Concentric exercise OR TS=Resistance program OR TI=Resistance program OR TS=Strength program OR TI=Strength program OR TS=Strength exercise OR TI=Strength exercise OR TS=Strength training OR TI=Strength training OR TS=Prehabilitation OR TI=Prehabilitation | 740,188 |
| #3 | TS = Randomized Controlled Trial OR TI = Randomized Controlled Trial | 633,474 |
| #4 | #1 AND #2 AND #3 | 563 |

**Table S5 Sensitivity analysis for Pain (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -1.05(-1.98,-0.12) | 87 | 0.03 |
| Domínguez et al. (21) | -1.53(-2.94,-0.13) | 93 | 0.03 |
| Skoffer et al. (18) | -1.80(-2.63,-0.97) | 79 | <0.0001 |
| Topp et al. (16) | -1.24(-2.45, -0.04) | 92 | 0.04 |

CI, confidence interval; SMD, standard mean difference.

**Table S6 Sensitivity analysis for Pain (≤1 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.30(-0.89,0.30) | 78 | 0.33 |
| Domínguez et al. (21) | -0.84(-1.89,0.21) | 92 | 0.12 |
| Skoffer et al. (18) | -0.79(-1.88,0.30) | 92 | 0.15 |
| Topp et al. (16) | -0.98(-1.84,-0.13) | 88 | 0.02 |
| Tungtrongjit et al. (17) | -0.63(-1.66,0.41) | 91 | 0.24 |

CI, confidence interval; SMD, standard mean difference.

**Table S7 Sensitivity analysis for Pain (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | 0.36(-1.22,1.95) | 95 | 0.65 |
| Skoffer et al. (18) | -0.34(-2.54,1.86) | 97 | 0.76 |
| Topp et al. (16) | -0.93(-2.06,0.20) | 90 | 0.11 |
| Tungtrongjit et al. (17) | 0.02(-2.07,2.10) | 97 | 0.99 |

CI, confidence interval; SMD, standard mean difference.

**Table S8 Sensitivity analysis for Knee function (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.71(-1.22,-0.20) | 46 | 0.007 |
| Domínguez et al. (21) | -2.15(-4.61,0.30) | 96 | 0.009 |
| Jahic et al. (20) | -1.85(-3.76,0.07) | 96 | 0.06 |
| Skoffer et al. (18) | -2.26(-4.53,0.01) | 95 | 0.05 |

CI, confidence interval; SMD, standard mean difference.

**Table S9 Sensitivity analysis for Knee function (≤1 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.73(-1.47,0.01) | 80 | 0.05 |
| Domínguez et al. (21) | -2.09(-3.73,-0.45) | 94 | 0.01 |
| Jahic et al. (20) | -1.39(-2.76,-0.02) | 94 | 0.05 |
| Skoffer et al. (18) | -2.03(-3.78,-0.28) | 95 | 0.02 |
| Tungtrongjit et al. (17) | -1.91(-3.74,-0.08) | 95 | 0.04 |

CI, confidence interval; SMD, standard mean difference.

**Table S10 Sensitivity analysis for Knee function (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.88(-1.91,0.15) | 85 | 0.09 |
| Jahic et al. (20) | -0.75(-1.64,0.14) | 85 | 0.10 |
| Skoffer et al. (18) | -1.52(-2.67,-0.37) | 85 | 0.01 |
| Tungtrongjit et al. (17) | -1.39(-2.86,0.08) | 91 | 0.06 |

CI, confidence interval; SMD, standard mean difference.

**Table S11 Sensitivity analysis for Knee function (6 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Jahic et al. (20) | NA | NA | NA |
| Tungtrongjit et al. (17) | NA | NA | NA |

CI, confidence interval; SMD, standard mean difference; NA, Not Applicable.

**Table S12 Sensitivity analysis for Strength(quadriceps) (Baseline)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.26(-0.66,0.15) | 58 | 0.21 |
| Domínguez et al. (21) | -0.24(-0.66,0.17) | 60 | 0.25 |
| Leeuwen et al. (22) | -0.22(-0.60,0.16) | 61 | 0.25 |
| Skoffer et al. (18) | -0.20(-0.62,0.22) | 61 | 0.36 |
| Topp et al. (16) | -0.05(-0.30,0.20) | 0 | 0.70 |
| Tungtrongjit et al. (17) | -0.30(-0.66,0.06) | 47 | 0.10 |

CI, confidence interval; SMD, standard mean difference.

**Table S13 Sensitivity analysis for Strength(quadriceps) (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | 0.38(-0.04,0.81) | 48 | 0.07 |
| Domínguez et al. (21) | 0.64(-0.25,1.53) | 87 | 0.16 |
| Leeuwen et al. (22) | 0.81(0.03,1.60) | 87 | 0.04 |
| Skoffer et al. (18) | 0.88(0.12,1.65) | 82 | 0.02 |
| Topp et al. (16) | 0.77(-0.13,1.67) | 87 | 0.09 |

CI, confidence interval; SMD, standard mean difference.

**Table S14 Sensitivity analysis for ROM (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **MD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | 3.85(-4.09,11.78) | 76 | 0.34 |
| Domínguez et al. (21) | 5.81(-5.66,17.27) | 91 | 0.32 |
| Skoffer et al. (18) | 10.18(6.55,13.80) | 0 | <0.00001 |

CI, confidence interval; MD, mean difference.

**Table S15 Sensitivity analysis for Functional ability (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.94(-2.00,0.11) | 90 | 0.08 |
| Domínguez et al. (21) | -1.53(-2.83,-0.22) | 92 | 0.02 |
| Leeuwen et al. (22) | -1.53(-2.76,-0.29) | 93 | 0.02 |
| Skoffer et al. (18) | -1.48(-2.86,-0.10) | 93 | 0.04 |
| Topp et al. (16) | -0.92(-1.91,0.08) | 89 | 0.07 |

CI, confidence interval; SMD, standard mean difference.

**Table S16 Sensitivity analysis for Functional ability (≤1 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -0.79(-1.55,-0.03) | 80 | 0.04 |
| Domínguez et al. (21) | -1.47(-2.56,-0.39) | 88 | 0.008 |
| Skoffer et al. (18) | -1.42(-2.60,-0.24) | 90 | 0.02 |
| Topp et al. (16) | -1.04(-2.19,0.11) | 90 | 0.08 |

CI, confidence interval; SMD, standard mean difference.

**Table S17 Sensitivity analysis for Functional ability (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -1.38(-2.54,-0.21) | 86 | 0.02 |
| Leeuwen et al. (22) | -1.84(-2.98,-0.69) | 88 | 0.002 |
| Skoffer et al. (18) | -2.36(-3.18,-1.54) | 57 | <0.00001 |
| Topp et al. (16) | -1.79(-3.77,0.20) | 93 | 0.08 |

CI, confidence interval; SMD, standard mean difference.

**Table S18 Sensitivity analysis for Stiffness (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | NA | NA | NA |
| Tungtrongjit et al. (17) | NA | NA | NA |

CI, confidence interval; SMD, standard mean difference; NA, Not Applicable.

**Table S19 Sensitivity analysis for WOMAC(total) (Immediately before TKA).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **MD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | NA | NA | NA |
| Leeuwen et al. (22) | NA | NA | NA |

CI, confidence interval; MD, mean difference; NA, Not Applicable.

**Table S20 Sensitivity analysis for WOMAC(total) (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **MD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | -13.16(-21.02,-5.30) | 0 | 0.001 |
| Leeuwen et al. (22) | -10.11(-21.45,1.23) | 72 | 0.08 |
| Tungtrongjit et al. (17) | -5.85(-7.78,-3.92) | 0 | <0.00001 |

CI, confidence interval; MD, mean difference.

**Table S21 Sensitivity analysis for Physical function (Immediately before TKA)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | NA | NA | NA |
| Jahic et al. (20) | NA | NA | NA |

CI, confidence interval; SMD, standard mean difference; NA, Not Applicable.

**Table S22 Sensitivity analysis for Physical function (3 months)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Studies** | **SMD (95% CI)** | ***I* 2 %** | ***P* Value** |
| Calatayud et al. (19) | NA | NA | NA |
| Jahic et al. (20) | NA | NA | NA |

CI, confidence interval; SMD, standard mean difference; NA, Not Applicable.

**TABLE S23** Assessment of publication bias

|  |  |  |  |
| --- | --- | --- | --- |
| **Outcomes** | **No.of studies** | **Begg’s test (*P* values)** | **Egger’s test (*P* values)** |
| **Pain** |  |  |  |
| Pain (immediately before TKA) | 4 | 0.089 | 0.044# |
| Pain (≤ 1 months) | 5 | 0.221 | 0.127 |
| Pain (3 months) | 4 | 1.000 | 0.941 |
| Pain (6 months) | 1 | NA | NA |
| Pain (12 months) | 2 | 1.000 | NA |
| **Knee function** |  |  |  |
| Knee function (immediately before TKA) | 4 | 0.089 | 0.140 |
| Knee function (≤ 1 months) | 5 | 0.462 | 0.046# |
| Knee function (3 months) | 4 | 0.308 | 0.168 |
| Knee function (6 months) | 2 | 1.000 | NA |
| Knee function (12 months) | 3 | 0.296 | 0.168 |
| **Strength [quadriceps]** |  |  |  |
| Strength [quadriceps] (immediately before TKA) | 5 | 0.462 | 0.718 |
| Strength [quadriceps] (≤ 1 months) | 4 | 1.000 | 0.792 |
| Strength [quadriceps] (3 months) | 5 | 0.806 | 0.671 |
| Strength [quadriceps] (6 months) | 1 | NA | NA |
| Strength [quadriceps] (12 months) | 2 | 1.000 | NA |
| **ROM** |  |  |  |
| ROM (immediately before TKA) | 3 | 0.296 | 0.295 |
| ROM (≤ 1 months) | 4 | 0.734 | 0.594 |
| ROM (3 months) | 3 | 1.000 | 0.702 |
| **Functional ability** |  |  |  |
| Functional ability (immediately before TKA) | 5 | 0.462 | 0.372 |
| Functional ability (≤ 1 months) | 4 | 0.308 | 0.125 |
| Functional ability (3 months) | 4 | 0.296 | 0.237 |
| **Stiffness** |  |  |  |
| Stiffness (immediately before TKA) | 1 | NA | NA |
| Stiffness (3 months) | 2 | 1.000 | NA |
| **WOMAC (total)** |  |  |  |
| WOMAC (total) (immediately before TKA) | 2 | 1.000 | NA |
| WOMAC (total) (3 months) | 3 | 1.000 | 0.823 |
| **Physical function** |  |  |  |
| Physical function (immediately before TKA) | 2 | 1.000 | NA |
| Physical function (3 months) | 2 | 1.000 | NA |

# indicates *P* < 0.05; NA, Not applicable.

**Table S24 - Evidence quality assessment according to GRADE.**

|  |
| --- |
| **Pain for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Pain** |  |  |  |  |
| **Pain - Pain (Immediately before TKA)** |  | The mean pain - pain (immediately before tka) in the intervention groups was**1.41 standard deviations lower**(2.37 to 0.44 lower) |  | 215(4 studies) | ⊕⊕⊕⊝**moderate**1 | SMD -1.41 (-2.37 to -0.44) |
| **Pain - Pain (≤ 1 months after TKA)**Follow-up: 1 months |  | The mean pain - pain (≤ 1 months after tka) in the intervention groups was**0.7 standard deviations lower**(1.53 lower to 0.13 higher) |  | 257(5 studies) | ⊕⊕⊕⊝**moderate**1 | SMD -0.7 (-1.53 to 0.13) |
| **Pain - Pain (3 months after TKA)**Follow-up: 3 months |  | The mean pain - pain (3 months after tka) in the intervention groups was**0.22 standard deviations lower**(1.74 lower to 1.29 higher) |  | 208(4 studies) | ⊕⊕⊝⊝**low**1 | SMD -0.22 (-1.74 to 1.29) |
| **Pain - Pain (6 months after TKA)**Follow-up: 6 months |  | The mean pain - pain (6 months after tka) in the intervention groups was**0.62 standard deviations lower**(1.13 to 0.1 lower) |  | 60(1 study) | ⊕⊝⊝⊝**very low**1 | SMD -0.62 (-1.13 to -0.1) |
| **Pain - Pain (12 months after TKA)**Follow-up: 12 months |  | The mean pain - pain (12 months after tka) in the intervention groups was**0.14 standard deviations lower**(0.58 lower to 0.31 higher) |  | 79(2 studies) | ⊕⊝⊝⊝**very low**1 | SMD -0.14 (-0.58 to 0.31) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S25 - Evidence quality assessment according to GRADE.**

|  |
| --- |
| **Knee function for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Knee function** |  |  |  |  |
| **Knee function - Knee function (Immediately before TKA)** |  | The mean knee function - knee function (immediately before tka) in the intervention groups was**1.75 standard deviations lower**(3.24 to 0.25 lower) |  | 181(4 studies) | ⊕⊕⊝⊝**low**1 | SMD -1.75 (-3.24 to -0.25) |
| **Knee function - Knee function (≤ 1 months after TKA)**Follow-up: 1 months |  | The mean knee function - knee function (≤ 1 months after tka) in the intervention groups was**1.62 standard deviations lower**(2.89 to 0.36 lower) |  | 223(5 studies) | ⊕⊕⊝⊝**low**1 | SMD -1.62 (-2.89 to -0.36) |
| **Knee function - Knee function (3 months after TKA)**Follow-up: 3 months |  | The mean knee function - knee function (3 months after tka) in the intervention groups was**1.12 standard deviations lower**(2.06 to 0.18 lower) |  | 174(4 studies) | ⊕⊕⊝⊝**low**1 | SMD -1.12 (-2.06 to -0.18) |
| **Knee function - Knee function (6 months after TKA)**Follow-up: 6 months |  | The mean knee function - knee function (6 months after tka) in the intervention groups was**0.64 standard deviations lower**(1.85 lower to 0.57 higher) |  | 80(2 studies) | ⊕⊝⊝⊝**very low**1 | SMD -0.64 (-1.85 to 0.57) |
| **Knee function - Knee function (12 months after TKA)**Follow-up: 12 months |  | The mean knee function - knee function (12 months after tka) in the intervention groups was**0.33 standard deviations lower**(0.73 lower to 0.07 higher) |  | 99(3 studies) | ⊕⊕⊝⊝**low**1 | SMD -0.33 (-0.73 to 0.07) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S26 - Evidence quality assessment according to GRADE.**

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| **Strength for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Strength** |  |  |  |  |
| **Strength [quadriceps] - Strength [quadriceps] (Immediately before TKA)** |  | The mean strength [quadriceps] - strength [quadriceps] (immediately before tka) in the intervention groups was**0.69 standard deviations higher**(0.01 to 1.38 higher) |  | 233(5 studies) | ⊕⊕⊕⊝**moderate**1 | SMD 0.69 (0.01 to 1.38) |
| **Strength [quadriceps] - Strength [quadriceps] (≤ 1 months after TKA)**Follow-up: 1 months |  | The mean strength [quadriceps] - strength [quadriceps] (≤ 1 months after tka) in the intervention groups was**0.12 standard deviations higher**(0.25 lower to 0.49 higher) |  | 203(4 studies) | ⊕⊕⊕⊝**moderate**1 | SMD 0.12 (-0.25 to 0.49) |
| **Strength [quadriceps] - Strength [quadriceps] (3 months after TKA)**Follow-up: 3 months |  | The mean strength [quadriceps] - strength [quadriceps] (3 months after tka) in the intervention groups was**0.63 standard deviations higher**(0.3 to 0.97 higher) |  | 224(5 studies) | ⊕⊕⊕⊝**moderate**1 | SMD 0.63 (0.3 to 0.97) |
| **Strength [quadriceps] - Strength [quadriceps] (6 months after TKA)**Follow-up: 6 months |  | The mean strength [quadriceps] - strength [quadriceps] (6 months after tka) in the intervention groups was**0.32 standard deviations higher**(0.19 lower to 0.83 higher) |  | 60(1 study) | ⊕⊝⊝⊝**very low**1 | SMD 0.32 (-0.19 to 0.83) |
| **Strength [quadriceps] - Strength [quadriceps] (12 months after TKA)**Follow-up: 12 months |  | The mean strength [quadriceps] - strength [quadriceps] (12 months after tka) in the intervention groups was**0.39 standard deviations higher**(0.05 lower to 0.84 higher) |  | 79(2 studies) | ⊕⊕⊝⊝**low**1 | SMD 0.39 (-0.05 to 0.84) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S27 - Evidence quality assessment according to GRADE.**

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| **ROM for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **ROM** |  |  |  |  |
| **ROM - ROM (Immediately before TKA)** |  | The mean rom - rom (immediately before tka) in the intervention groups was**6.54 higher**(0.5 lower to 13.58 higher) |  | 161(3 studies) | ⊕⊕⊝⊝**low**1 |  |
| **ROM - ROM (≤ 1 months after TKA)**Follow-up: 1 months |  | The mean rom - rom (≤ 1 months after tka) in the intervention groups was**3.17 higher**(0.98 lower to 7.32 higher) |  | 203(4 studies) | ⊕⊕⊕⊝**moderate**1 |  |
| **ROM - ROM (3 months after TKA)**Follow-up: 3 months |  | The mean rom - rom (3 months after tka) in the intervention groups was**3.54 higher**(0.16 to 6.92 higher) |  | 154(3 studies) | ⊕⊕⊝⊝**low**1 |  |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S28 - Evidence quality assessment according to GRADE.**

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| **Functional ability for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Functional ability** |  |  |  |  |
| **Functional ability - Functional ability (Immediately before TKA)** |  | The mean functional ability - functional ability (immediately before tka) in the intervention groups was**1.28 standard deviations lower**(2.34 to 0.22 lower) |  | 233(5 studies) | ⊕⊕⊕⊝**moderate**1 | SMD -1.28 (-2.34 to -0.22) |
| **Functional ability - Functional ability (≤ 1 months after TKA)**Follow-up: 1 months |  | The mean functional ability - functional ability (≤ 1 months after tka) in the intervention groups was**1.18 standard deviations lower**(2.07 to 0.28 lower) |  | 197(4 studies) | ⊕⊕⊝⊝**low**1 | SMD -1.18 (-2.07 to -0.28) |
| **Functional ability - Functional ability (3 months after TKA)**Follow-up: 3 months |  | The mean functional ability - functional ability (3 months after tka) in the intervention groups was**1.84 standard deviations lower**(2.98 to 0.69 lower) |  | 164(4 studies) | ⊕⊕⊕⊝**moderate**1 | SMD -1.84 (-2.98 to -0.69) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S29 - Evidence quality assessment according to GRADE.**

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| **Stiffness for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Stiffness** |  |  |  |  |
| **Stiffness - Stiffness (Immediately before TKA)** |  | The mean stiffness - stiffness (immediately before tka) in the intervention groups was**1.97 standard deviations lower**(2.65 to 1.28 lower) |  | 50(1 study) | ⊕⊝⊝⊝**very low**1 | SMD -1.97 (-2.65 to -1.28) |
| **Stiffness - Stiffness (3 months after TKA)**Follow-up: 3 months |  | The mean stiffness - stiffness (3 months after tka) in the intervention groups was**1.26 standard deviations lower**(2.17 to 0.35 lower) |  | 104(2 studies) | ⊕⊕⊝⊝**low**1 | SMD -1.26 (-2.17 to -0.35) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S30 - Evidence quality assessment according to GRADE.**

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| --- |
| **WOMAC(total) for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **WOMAC(total)** |  |  |  |  |
| **WOMAC (total) - WOMAC (total) [Immediately before TKA]** |  | The mean womac (total) - womac (total) [immediately before tka] in the intervention groups was**11.72 lower**(27.75 lower to 4.31 higher) |  | 68(2 studies) | ⊕⊝⊝⊝**very low**1 |  |
| **WOMAC (total) - WOMAC (total) [3 months after TKA]**Follow-up: 3 months |  | The mean womac (total) - womac (total) [3 months after tka] in the intervention groups was**9.02 lower**(15.48 to 2.55 lower) |  | 120(3 studies) | ⊕⊕⊝⊝**low**1 |  |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |

**Table S31 - Evidence quality assessment according to GRADE.**

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| **Physical function for KOA** |
| **Patient or population:** patients with KOA**Settings:** **Intervention:** Preoperative strength training or Preoperative strength training combined with other interventions |
| **Outcomes** | **Illustrative comparative risks\* (95% CI)** | **Relative effect(95% CI)** | **No of Participants(studies)** | **Quality of the evidence(GRADE)** | **Comments** |
| Assumed risk | Corresponding risk |
|  | **Control** | **Physical function** |  |  |  |  |
| **Physical function - Physical function (Immediately before TKA)** |  | The mean physical function - physical function (immediately before tka) in the intervention groups was**2.37 standard deviations higher**(0.61 to 4.14 higher) |  | 70(2 studies) | ⊕⊕⊝⊝**low**1 | SMD 2.37 (0.61 to 4.14) |
| **Physical function - Physical function (3 months after TKA)**Follow-up: 3 months |  | The mean physical function - physical function (3 months after tka) in the intervention groups was**0.68 standard deviations higher**(0.18 lower to 1.54 higher) |  | 64(2 studies) | ⊕⊝⊝⊝**very low**1 | SMD 0.68 (-0.18 to 1.54) |
| \*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).**CI:** Confidence interval;  |
| GRADE Working Group grades of evidence**High quality:** Further research is very unlikely to change our confidence in the estimate of effect. **Moderate quality:** Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.**Low quality:** Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.**Very low quality:** We are very uncertain about the estimate. |
| 1 No explanation was provided |