**Appendix A. Key Questions from full AHRQ Comparative Effectiveness Review**

Note that Key Questions (KQ) 1, 4, and 4 are addressed in the companion articles.

**KQ 1:** What are the effects, comparative effects, and harms of (preoperative) prehabilitation services (and specific components) for patients with osteoarthritis undergoing elective, unilateral total knee replacement surgery on patient-reported outcomes, performance-based outcomes, and healthcare utilization?

**KQ 2:** What are the effects, comparative effects, and harms of (postoperative) rehabilitation services (and specific components) for patients with osteoarthritis undergoing elective, unilateral total knee replacement surgery on patient-reported outcomes, performance-based outcomes, and healthcare utilization?

**KQ 3:** What are the effects, comparative effects, and harms of (preoperative) prehabilitation services (and specific components) for patients with osteoarthritis undergoing elective, unilateral total hip replacement surgery on patient-reported outcomes, performance-based outcomes, and healthcare utilization?

**KQ 4:** What are the effects, comparative effects, and harms of (postoperative) rehabilitation services (and specific components) for patients with osteoarthritis undergoing elective, unilateral total hip replacement surgery on patient-reported outcomes, performance-based outcomes, and healthcare utilization?

**For all KQs:**

**Subquestion a:** Do the effects, comparative effects, and harms vary by patient factors, such as age, sex, race/ethnicity, socioeconomic status, body mass index, and comorbidities?

**Subquestion b:** Do the effects, comparative effects, and harms vary by surgical factors, such as surgical procedure, type of implant, perioperative protocol, type of hospital, and length of hospital stay?

**Subquestion c:** Do the effects, comparative effects, and harms vary by setting of active structured physical activity programs?

**Contextual Question**

What are the major direct and indirect cost factors for the various aspects of rehabilitation and prehabilitation around major joint replacement surgery, including such factors as personnel, setting overhead, materials, and training?

**Appendix C. Methods**

**Literature Search Strategies**

Note that the full search strategy included searches for research questions about prehabilitation and rehabilitation for total knee arthroplasty and total hip arthroplasty. These can be found in Appendix A of the full report (see article for reference).

All searches restricted to January 2005 to May 3, 2021 (final search date, updated from full report search on April 16, 2020)

**Medline (via PubMed)**

((arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) OR "Arthroplasty, Replacement, Hip"[Mesh] OR "Arthroplasty, Replacement, Knee"[Mesh] OR (("Arthroplasty"[Mesh] or arthroplasty or replacement) and (knee or hip)))

AND

((pre-hab\* or prehab\*) OR "Arthroplasty, Replacement, Knee/rehabilitation"[Mesh] OR "Arthroplasty, Replacement, Hip/rehabilitation"[Mesh] OR ((presurg\* or preoperativ\* or pre-surg\* or pre-operativ\* or early or home) and (rehab or rehabilitate or rehabilitation or re-hab\* or "Rehabilitation"[Mesh] or "Physical Therapy Modalities"[Mesh] or “physical therapy” or physiotherapy\*)) OR ("Preoperative Care/methods"[Mesh] OR "Preoperative Care/rehabilitation"[Mesh] ) OR ((before or prior to) and (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) and (rehab or rehabilitate or rehabilitation or re-hab\* or intervention\* or recovery)) OR ((“Preoperative Care”[MESH] OR “Preoperative Period”[MESH]) and (rehab or rehabilitate or rehabilitation or re-hab\* or "Rehabilitation"[Mesh] or "Physical Therapy Modalities"[Mesh] or “physical therapy” or physiotherapy\*)) OR (“Postoperative Period”[Mesh] and (rehab or rehabilitate or rehabilitation or re-hab\*)) OR ((postsurg\* or post-surg\* or postoperativ\* or post-operativ\*) AND (rehab or rehabilitate or rehabilitation or re-hab\* or "Rehabilitation"[Mesh] or "Physical Therapy Modalities"[Mesh] or “physical therapy” or physiotherapy\*)) OR ((after or post) AND (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) AND (rehab or rehabilitate or rehabilitation or re-hab\* or "Rehabilitation"[Mesh] or "Physical Therapy Modalities"[Mesh] or “physical therapy” or physiotherapy\*)))

AND

("Cohort Studies"[Mesh] OR cohort OR "Clinical Trial" [Publication Type] OR (follow-up or followup) OR longitudinal OR "Placebos"[Mesh] OR placebo\* OR "Research Design"[Mesh] OR "Evaluation Study" [Publication Type] OR "Comparative Study" [Publication Type] OR ((comparative or Intervention) AND study) OR pretest\* OR posttest\* OR prepost\* OR “before and after” OR interrupted time\* OR time serie\* OR intervention\* OR ((quasi-experiment\* OR quasiexperiment\* OR quasi or experimental) and (method or study or trial or design\*)) OR “real world” OR “real-world” OR "Case-Control Studies"[Mesh] OR (case and control) OR "Random Allocation"[Mesh] OR "Clinical Trial" [Publication Type] OR "Double-Blind Method"[Mesh] OR "Single-Blind Method"[Mesh] OR random\* OR "Placebos"[Mesh] OR placebo OR ((clinical OR controlled) and trial\*) OR ((singl\* or doubl\* or trebl\* or tripl\*) and (blind\* or mask\*)) OR rct OR crossover OR cross-over OR cross-over OR RCT OR "Randomized Controlled Trial" [Publication Type] OR systematic[sb] OR meta-analysis[pt] OR meta-analysis as topic[mh] OR meta-analysis[mh] OR meta analy\* OR metanaly\* OR metaanaly\* OR met analy\* OR (systematic AND (review\* OR overview\*)) OR "Review Literature as Topic"[Mesh] OR cochrane[tiab] OR embase[tiab] OR (psychlit[tiab] or psyclit[tiab]) OR (psychinfo[tiab] or psycinfo[tiab]) OR (cinahl[tiab] OR cinhal[tiab] OR “cumulative index to nursing and allied health”) OR science citation index[tiab] OR ibids[tiab] OR “international bibliographic information on dietary supplements” OR cancerlit[tiab] OR reference list\*[tiab] OR bibliograph\*[tiab] OR hand-search\*[tiab] OR relevant journals[tiab] OR manual search\*[tiab] OR ((selection OR inclusion OR exclusion) AND criteria[tiab]) OR data extraction[tiab] OR relevant journals OR "Systematic Review" [Publication Type])

NOT

(“address”[pt] or “autobiography”[pt] or “bibliography”[pt] or “biography”[pt] or “case reports”[pt] or “comment”[pt] or “congress”[pt] or “dictionary”[pt] or “directory”[pt] or “festschrift”[pt] or “historical article”[pt] or “interview”[pt] or “lecture”[pt] or “legal case”[pt] or “legislation”[pt] or “news”[pt] or “newspaper article”[pt] or “patient education handout”[pt] or “periodical index”[pt] or "comment on" or ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] or rat[tw] or cow[tw] or cows[tw] or chicken\*[tw] or horse[tw] or horses[tw] or mice[tw] or mouse[tw] or bovine[tw] or sheep[tw] or ovine[tw] or murinae[tw] or cats[tw] or cat[tw] or dog[tw] or dogs[tw] or rodent[tw] )

**Embase**

#5 #3 AND #4 AND ([article]/lim OR [article in press]/lim) AND [2005-2020]/py

#4 'pre hab\*' OR prehab\* OR ((presurg\* OR preoperativ\* OR 'pre surg\*' OR 'pre operativ\*' OR early OR home) AND (rehab OR rehabilitate OR rehabilitation OR 're hab\*' OR 'physical therapy' OR physiotherapy\*)) OR ((before OR prior) AND to AND ((((((arthroplast\* OR hip) AND replacement\* OR knee) AND replacement\* OR joint) AND replacement\* OR total) AND hip OR total) AND knee OR total) AND joint\* AND (rehab OR rehabilitate OR rehabilitation OR 're hab\*' OR intervention\* OR recovery)) OR ((postsurg\* OR 'post surg\*' OR postoperativ\* OR 'post operativ\*') AND (rehab OR rehabilitate OR rehabilitation OR 're hab\*' OR 'physical therapy' OR physiotherapy\*)) OR ((after OR post) AND ((((((arthroplast\* OR hip) AND replacement\* OR knee) AND replacement\* OR joint) AND replacement\* OR total) AND hip OR total) AND knee OR total) AND joint\* AND (rehab OR rehabilitate OR rehabilitation OR 're hab\*' OR 'physical therapy' OR physiotherapy\*))

#3 #1 OR #2

#2 (hip OR knee) AND replacement

#1 'arthropathy'/exp OR 'arthropathy' AND (knee OR hip)

**Cochrane**

#1 MeSH descriptor: [Arthroplasty, Replacement, Hip] explode all trees

#2 MeSH descriptor: [Arthroplasty, Replacement, Knee] explode all trees

#3 (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*)

#4 ((arthroplasty or replacement) and (knee or hip))

#5 #1 OR #2 OR #3 OR #4

#6 (pre-hab\* or prehab\* OR ((presurg\* or preoperativ\* or pre-surg\* or pre-operativ\* or early or home) and (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)) OR ((before or prior to) and (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) and (rehab or rehabilitate or rehabilitation or re-hab\* or intervention\* or recovery)) OR ((postsurg\* or post-surg\* or postoperativ\* or post-operativ\*) AND (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)) OR ((after or post) AND (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) AND (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)))

#7 #5 AND #6

**CINAHL**

(arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\* or ((arthroplasty or replacement) and (knee or hip)))

AND

(pre-hab\* or prehab\* or ((presurg\* or preoperativ\* or pre-surg\* or pre-operativ\* or early or home) and (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)) or ((before or prior to) and (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) and (rehab or rehabilitate or rehabilitation or re-hab\* or intervention\* or recovery)) or ((postsurg\* or post-surg\* or postoperativ\* or post-operativ\*) and (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)) OR ((after or post) AND (arthroplast\* or hip replacement\* or knee replacement\* or joint replacement\* or total hip or total knee or total joint\*) AND (rehab or rehabilitate or rehabilitation or re-hab\* or “physical therapy” or physiotherapy\*)))

**Inclusion/Exclusion Criteria**

Population(s)

* Adults (≥18 years old) undergoing (or planning to undergo) total hip or knee replacement surgery
  + for primary osteoarthritis
  + elective (nonemergent) surgery
  + primary surgery (not revision)
  + unilateral TJR
* Exclude: Studies where >10% of patients underwent total knee or hip replacement surgery:
  + for partial joint replacement
  + for causes other than primary osteoarthritis (e.g., cancer, trauma, rheumatoid arthritis)
  + for emergency surgery
  + for revision joint replacement
  + bilateral TJR (simultaneous in both joints)
* N.B. Studies that reported stratified or subgroup analyses of the population of interest were included if they meet the other eligibility criteria (e.g., if they included unilateral and bilateral surgeries but reported data specific to unilateral)
* Did not exclude based on prior surgeries to other joints (including contralateral hip or knee)

**Intervention(s):**

* Active, structured physical activity or activities designed to attain measurable goals of reducing impairments and improving movement-related function as defined by the International Classification of Functioning, Disability and Health (ICF)
  + Any movement-related physical goal including improvements beyond the basal (or baseline) state in: mobility and stability of joint function (including flexibility and range of motion), movement control, power and tone of muscles (including strength), gait, endurance; along with the related goal of reducing pain.
  + Interventions need to be sufficiently described to be replicable by a therapist or other professional. The exception to this was rehabilitation interventions delivered in different settings (inpatient vs. outpatient), which we included even if there was not sufficient detail about their (p)rehabilitation interventions (and noted such in our coding).
  + Single or multiple components. For multicomponent interventions, the goals of the intervention criteria refer to the overall intervention, not necessarily to each individual component. We categorized the content of the rehabilitation interventions according to a categorization scheme based on ongoing research by Oatis and Franklin to develop a taxonomy defining the components of physical therapy after TKR.1, 2 The taxonomy comprehensively lists specific rehabilitation content that are hierarchically linked to larger rehabilitation goals. The larger component goals include:
    - Strengthening exercise
    - Aerobic exercise
    - Flexibility exercise
    - Balance-motor/learning-agility exercise
    - Task specific training
    - Patient education
  + We used the taxonomy to code both the subcategory content and larger category goals (e.g., intervention content of squats would be coded for the subcategory of “squats” hierarchically linked to the goal of “strengthening”).
  + *Exclude:* Continuous passive motion (CPM) was not included as there is strong evidence, summarized in an existing systematic review,3 that that component is ineffective.
  + The intervention had to have be delivered, supervised, and/or monitored by a healthcare professional or other trained individual (e.g., physical therapist, physical therapy assistant, nurse trained in rehabilitation, health educator with training in exercise delivery or rehabilitation, other healthcare professional trained in rehabilitation)
    - Peer-led (or patient-led) interventions were eligible if monitored by a professional or other trained individual
    - The physical therapist (or other trained individual) had to have been involved in patient engagement and assessment of progress, and provided ongoing feedback to the patient throughout the course of intervention
      * This interaction could have been direct (e.g., in-person therapy) or remote (e.g., via app, Web, or telephone)
      * Remote therapy had to have included active monitoring by a physical therapist (or other trained individual), although the (p)rehabilitation therapy could have been guided completely by the app
  + The patient needed to be actively involved or engaged in at least part of the intervention (and not be only a passive recipient of the intervention)
* Interventions evaluating the combined benefit an intervention defined above with an adjunctive modality were also included.   
  Adjunctive modalities are either passively applied to patients and/or do not (on their own) have the direct goals of reducing impairments or improving movement-related function but are used to help other components achieve these goals. Examples of therapies that were considered adjunctive modalities if combined with an intervention meeting criterion above included:
  + Neuromuscular electrical stimulation (NMES)
  + Transcutaneous electrical nerve stimulation (TENS)
  + Manual therapy (e.g., therapeutic massage, passive range of motion)
  + Biofeedback devices
  + Cryotherapy (or other thermal therapies)
  + Dry needling
  + Mindfulness, stress/anxiety-reduction interventions
  + Complementary and alternative therapies (*excluding* ingested, inhaled, or transcutaneous treatments)
  + Modalities had to have been sufficiently described to be replicable by a therapist or other professional
* *Exclude*: Interventions that were not active, structured physical activities delivered by a healthcare professional or other trained individual, including devices not designed to be used primarily during active therapy; for example:
  + Splinting, bracing, taping
  + One-time distribution of information
  + Assistive devices (e.g., crutches vs. canes or walkers)
* *Exclude*: Interventions (as a whole) without specific goals (e.g., unsupervised swimming, walking, cycling, hiking).
* *Exclude*: Interventions (as a whole) without active engagement of the healthcare professional (e.g., only set-up and removal of intervention without monitoring, or healthcare professional engagement only to measure pre- and post-intervention outcome measures).
* *Exclude*: Surgical or hospital process-improvement interventions (e.g., early mobilizations, enhanced recovery after surgery [ERAS], care managers, pre-anesthesia protocols)
* Exclude: Pharmaceutical (or over-the-counter) treatments (although, allowed as part of an overall intervention)

**Comparator(s):**

* No active, structured physical activity, as defined above
  + Allow “usual care” only if the intervention arm includes well-defined components or adjunctive modalities plus the same “usual care”
* Other active structured physical activity (or set of activities)
* Other adjunctive modality
* Different duration (or intensity) of intervention
* Different providers
* Different setting
* *Exclude*: no comparison (or comparison with only pre-intervention state)

**Outcomes:** (\* denotes important/priority outcomes that were included in Strength of Evidence tables)

* Patient-reported outcomes
  + Activities of daily living\*
  + Patient satisfaction with care\*
  + Quality of life (QoL)\*
  + Pain
  + Injury related to arthroplasty (e.g., fall)
  + Time lost from work
  + Measures that combined these outcome domains (e.g., Hip disability/Knee injury and osteoarthritis outcome score [HOOS/KOOS])
* Performance-based outcomes
  + Mobility of joint function (e.g., knee range of motion)\*
  + Power and tone of muscle (e.g., strength)\*
  + Joint stability
  + Endurance
  + Gait
  + Balance
  + Measures that combined these domains (e.g., timed-up-and-go [TUG], stair climb test)
* Healthcare utilization
  + Hospital- or surgical clinic-based procedures postoperatively (e.g., need for manipulation under anesthesia)\*
  + Hospital readmission
  + Postoperative care (excluding physical therapy services)
* Harms
  + Injury related to therapy intervention\*
  + Other harms related to therapy intervention

**Modifiers/Subgroups of interest:**

* Patient factors:
  + Demographics (age, sex, race/ethnicity, education, region)
  + Body mass index
  + Comorbidities, including mental health and other joint comorbidities
  + Socioeconomic status, insurance status
  + Prior arthroplasty of contralateral joint
  + Preoperative symptoms/status
    - Severity of preoperative symptoms, including pain, impaired function, restricted movement, and physical activity
    - Frailty (and related assessments of preoperative function)
  + Narcotic use
  + Caregiver support (outside of (p)rehabilitation)
* Surgical factors:
  + Surgical procedure
  + Perioperative protocols (e.g., enhanced recovery after surgery)
  + Type of implant
  + Setting of surgery
    - Type of hospital (e.g., community, referral/teaching, or urban/suburban/rural)
* Setting factors:
  + Setting of intervention (e.g., inpatient, outpatient center, rehabilitation center, home)
  + Was considered as a modifier only regarding the same intervention provided in different settings

**Timing:**

* Study publication date >2005
* ≥50% of surgeries occurred after 2005
* Outcomes
  + Patient-reported and performance-based outcomes[[1]](#footnote-1)
    - ≥3 months postoperative for KQ 1 and 2 (TKA)
    - ≥6 months postoperative for KQ 3 and 4 (THA)
  + Healthcare utilization outcomes
    - Perioperative for KQ 1 and 3 (prehabilitation)
    - ≤3 months
    - For prehabilitation, starting at the initiation of intervention
  + Harms: duration of (p)rehabilitation intervention

**Setting:**

* Any setting, including:
  + Acute inpatient (postoperative)
  + Other inpatient facility (e.g., skilled nursing facility)
  + Physical therapy/rehabilitation facility (outpatient)
  + Home
  + Gym or other community center
  + Other

**Design:**

* RCTs, N>20 per group
* NRCS, N>20 per group, with or without adjustment for confounders
  + Prospective or retrospective (as long as there was a clear, specific intervention)
  + Parallel or series comparisons (i.e., “pre-post” studies that evaluate different cohorts of patients receiving vs. not receiving an intervention before and after a change in available (p)rehabilitation services)
* Cost-effectiveness (and related) analyses (for relevant QoL data, as available)
* *Exclude*: noncomparative (single group) studies (i.e., where all received the same intervention and there is no comparison intervention)
* *Exclude*: crossover studies (where the same individual receives more than one intervention in series)
* *Exclude*: case reports or series; case-control studies {Davis, 2011 #523}

Additional Criteria for KQs 1 and 3 (Prehabilitation)

**Population:**

* Patients in whom the decision has been made to have a joint replacement surgery
* *Exclude*: Patients who are trying to avoid or delay surgery

**Interventions:**

* Delivered within 3 months prior to surgery
* *Exclude*: Preoperative interventions designed to reduce symptoms or prevent or delay surgery; i.e., interventions not designed to be prehabilitation for planned surgery

**Outcomes (in addition to those listed above for all KQs):**

* Healthcare utilization
  + Length of stay (postoperative)\*
  + Posthospital disposition (e.g., to home, outpatient, skilled nursing facility, “subacute” rehabilitation, “acute” inpatient rehabilitation)\*
  + Length of (postoperative) rehabilitation needed
* Harms
  + Perioperative surgical complications

Additional Criteria for KQs 2 and 4 (Postoperative rehabilitation)

**Interventions:**

* Delivered within 6 months following surgery

**Potential Modifiers:**

* Length of hospital stay

**Coding the Rehabilitation Interventions**

**Guiding Principles and Assumptions**

* We assumed that some studies may describe interventions vaguely, that is, by the goal of the intervention (e.g., strengthening exercises) rather than the specific content components being delivered to achieve that goal (e.g., squats to promote muscle strength).
* We understood that some specific components of (p)rehabilitation interventions may target multiple (p)rehabilitation goals (e.g., step downs may have the goal of improving strength and balance).
* We assumed that the effects of interventions as defined by their i) goals and ii) specific content components are of interest to decision-makers to understand impact of (p)rehabilitation interventions from different categorization perspectives and given the limitations of varying reporting detail.
* We assumed that identifying the gaps in describing (p)rehabilitation interventions according to both their i) goals and ii) specific content components is of interest to decision-makers to identify areas for improving the design and reporting of primary studies
* We assumed that refining linkage of i) goals and ii) specific content components is of interest to decision-makers to improve intervention design and professional practice (e.g., understand what specific components are most/least frequently used to achieve certain goals and lead to most/least change in outcomes).

**Coding Process and Taxonomy**

We used Oatis/Franklin’s hierarchical taxonomy 1to code both the intervention goal and specific content components, as feasible. The adapted taxonomy included 147 specific components.

We coded interventions:

* Per large categories largely defined by the goal/aim of the intervention (n=6 components)
  + Strengthening
  + Aerobic
  + Flexibility
  + Balance-motor/Learning-agility
  + Task specific training
  + Patient education (see note below)
    - Note that while we coded patient education, the intervention (as a whole) had to meet the criteria of an active, structured rehabilitation program. Thus, patient education alone would not be eligible.
* Per smaller sub-categories nested within the large categories (that are not all distinct and may target multiple goals/aims) (n=129 specific content components)
  + Strengthening (n=63 components)
  + Aerobic (n=9 components)
  + Flexibility (n=17 components)
  + Balance-motor/Learning-agility (n=17 components)
  + Task specific training (n=17 components)
  + Patient education (n=6 components)
* Each study was independently coded by two investigators, one with expertise in rehabilitation interventions (LMT, DP) and the other with expertise in multicomponent interventions (KJK)
* Each investigator reviewed the content of the intervention and:
  + Sought to match the content to a **specific content** component*(i.e., subcategories)*. Where a match could be made, the investigator inserted a code ‘1’ to indicate its presence in cell (otherwise ‘0’ to indicate absence).
  + Subsequently sought to match the **specific content** component to the higher category intervention **goal**. Determination of the goal of the **specific content** component was based on the hierarchical taxonomy and interpretation of how the component was used (e.g., description of the parameters used to implement it) and other contextualizing details of the text.
    - The latter was especially important for specific content components capable of addressing multiple goals (e.g., ‘step down’ can address “strengthening” and “balance-motor learning-agility”).
  + Inserted article text used to justify any specific content component or goal codes in the cell for the larger goal category and indicated what specific content component the text was meant to justify.
    - Descriptive content was used to justify coding where discrepancies arose and provided qualitative text for further consideration of the taxonomy.
* One investigator compared codes, raised disagreements, prepared for consensus meeting (KJK).
* Both investigators (KJK and LMT or KJK and DP) met to discuss and come to consensus, revising coding rules as necessary.
* Where conflicts remained, a third reviewer (LMT or DP depending on who was the primary coder) was engaged in group discussion until consensus was achieved.

**Additional General Principles**

The following principles were used to guide intervention coding:

1. The intervention of at least one arm of each included study needed to be sufficiently described to be replicable by a therapist or other professional.
   1. Studies defining interventions as “rehabilitation” without further detail were excluded.
   2. Studies defining interventions based on rehabilitation goals only (e.g., “strengthening exercises”) were included and coded according to the goal, but not regarding the specific content component for which there was no information
2. We coded the rehabilitation i) goals and ii) specific content components of all study arms, regardless of arm label (e.g., control, “treatment as usual”) if rehabilitation content and goals met the descriptions above.

**Adjunctive Modalities and Intervention Modifiers**

In addition to coding primary intervention components (by goals and specific content components, above), we coded the presence of the following 18 **adjunctive modalities**:

* Modalities
  + Cold
  + Heat
  + Compression for edema
  + E-stim for pain (TENS)
  + E-stim for strength (NMES)
  + Other modalities for pain
  + Ultrasound
* Manual therapy (e.g., therapeutic massage, passive range of motion)
  + Contract-relax for knee flexion/extension ROM
  + Hold-relax for knee flexion/extension ROM
  + Massage for edema control
  + Massage for scar mobility
  + Massage/myofascial techniques for soft tissue
  + Mobilizations – Tibiofemeral
  + Mobilizations - Patellar
* Biofeedback devices
* Dry needling
* Mindfulness, stress/anxiety-reduction interventions
* Complementary and alternative therapies (*excluding* ingested or inhaled treatments)

**Intervention modifiers**:

* *Progression.* Study states that progression was a part of the intervention (Code 1=yes; 0=no).
* *Appropriate progression*. Progression deemed appropriate based on parameters defined (Code 1=present; 0=absent).
* *Personnel.* The intervention must be delivered, supervised, and/or monitored by a healthcare professional or other trained individual. Peer-led (or patient-led) interventions are eligible if monitored by a professional or other trained individual. The physical/healthcare professional (or other trained individual) must be involved in patient engagement and assessment of progress, and must provide ongoing feedback to the patient throughout the course of intervention
* *Mode of delivery.* The interaction with the healthcare professional or other trained individual may be direct (e.g., in-person therapy) or remote (e.g., via app, Web, or telephone). Remote therapy must include active monitoring by a physical therapist (or other trained individual), although the (p)rehabilitation therapy may be guided completely by the app.
* *Setting of intervention.* Physical location in which the intervention was delivered (may overlap slightly with mode of delivery). Select all that apply
  + Acute inpatient (postoperative)
  + Other inpatient facility (e.g., skilled nursing facility)
  + Physical therapy/rehabilitation facility (outpatient)
  + Home
  + Gym or other community center
  + Other (specify)
  + Not reported

**Specific Coding Elements**

* MJR\_id (number=unique ID for study as created by MJR review)
* source (text= file pdf name used and additional sources other than primary paper).
* Exclude (category=yes/no/maybe). If no or maybe, give reason in note
* Exclude\_note (text =specific text describing why intervention is/is not well specified)

Labels:

* arm\_name (text=specific label for arm as written in article; each study arm extracted into a unique row)
* Ix\_well\_specified (binary 0=no; 1=yes; is the intervention as a whole well specified?)
  + Code YES if: Intervention is sufficiently described to be replicable by a therapist or other professional in practice
  + Code NO if: Intervention is generally not well specified
* Ix\_well\_specified\_note (text =specific text describing why intervention is/is not well specified)

**Intervention i) Goal and ii) Specific Content**

**For each arm evaluated in the study, determine:**

**1. Strengthening** (binary 0=no; 1=yes)

Code YES (to strengthening goal) if intervention describes

* + Strengthening exercise generally
  + One or more of the specific content components below and coder interprets that component supports the strengthening goal (also code YES to the specific content binary 0=no; 1=yes)

- If position unclear code 1 (position unclear) for all relevant codes

1.1 Bridges One-legged (supine hip extension)

1.2 BridgesTwo-legged (supine hip extension)

1.3 Calf press (one-leg)

1.4 Calf press (two-legs)

1.5 Clamshells

1.6 Core strengthening

1.7 Deadlifts

1.8 Gluteal Sets

1.9 Heel raises – bilateral

1.10 Heel raises – unilateral

1.11 Hip abduction in sidelying

1.12 Hip abduction in standing

1.13 Hip abduction in supine

1.14 Hip adduction in sidelying

1.15 Hip adduction in standing

1.16 Hip adduction in supine

1.17 Hip extension in sidelying

1.18 Hip extension in prone

1.19 Hip extension in standing

1.20 Hip flexion in sidelying

1.21 Hip flexion in sitting

1.22 Hip flexion in standing

1.23 Hip flexion in supine

1.24 Hip hikes in standing

1.25 Hip hikes in supine

1.26 Hip rotation external (lateral)

1.27 Hip rotation internal (medial)

1.28 Knee extension machine (one-leg)

1.29 Knee extension machine (two-legs)

1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)

1.31 Knee extension in sitting or supine (long arc quad)

1.32 Knee extension in sitting or supine (short arc quad)

1.33 Knee flexion machine (Hamstring curl) one knee

1.34 Knee flexion machine (Hamstring curl) two knees

1.35 Knee flexion in prone

1.36 Knee flexion in sitting or supine

1.37 Knee flexion in standing

1.38 Leg Press (one leg)

1.39 Leg Press (two legs)

1.40 Leg Press (side lying)

1.41 Lunges

1.42 Lunges to side (lateral lunge)

1.43 Quad sets

1.44 Quadruped arm lift

1.45 Quadruped leg lift

1.46 Quadruped arm and leg lift

1.47 Single Leg Stance (SLS)

1.48 Sit-to-stand

1.49 Squats

1.50 Squats (one leg)

1.51 Standing TKE (terminal knee extension)

1.52 Step down

1.53 Step down laterally

1.54 Step lateral

1.55 Step up – forward

1.56 Step up – lateral

1.57 Stool scoots

1.58 Straight leg raise (SLR)

1.59 Toe raises

1.60 Upper extremity strengthening

1.61 Wall slides

1.62 Wall slides - Lateral (hip AB and ADductors)

1.63 Open chain ankle dorsiflexion/plantar flexion/inversion/eversion (added from original taxonomy)

Code NO if:

* + No mention of strengthening exercise goal generally
  + No mention of specific content components interpreted as seeking to improve the strengthening goal

Strengthening note (text=text to support goal and specific content codes)

**2. Aerobic** (binary 0=no; 1=yes)

Code YES (to aerobic endurance goal) if intervention describes

* + Aerobic exercise generally
  + One or more of the specific content components below and coder interprets that component supports the aerobic endurance goal (also code YES to the specific content binary 0=no; 1=yes

2.1 Aquatics (water aerobics, water walking)

2.2 Bike (Endurance)

2.3 Elliptical machine

2.4 Jogging in place or overland

2.5 Rowing machine

2.6 Step-ups

2.7 Stepper (upright or sitting)

2.8 Treadmill walking

2.9 Walking

Code NO if:

- No mention of aerobic exercise goal generally

- No mention of specific content components interpreted as seeking to improve the aerobic endurance goal

Aerobic note (text =text to support goal and specific content codes)

**3. Flexibility** (binary 0=no; 1=yes)

Code YES (to flexibility goal) if intervention describes

- Flexibility exercise generally

- One or more of the specific content components below and coder interprets that component supports the flexibility goal (also code YES to the specific content binary 0=no; 1=yes)

- If position unclear code 1 (position unclear) for all relevant codes

3.1 Ankle pumps

3.2 Bike (ROM)

3.3 Calf stretch with knee bent

3.4 Calf stretch with knee straight

3.5 Hamstring stretch in any position

3.6 Heel slides

3.7 Hip extensor stretch (knee to chest)

3.8 Hip flexor stretch

3.9 Iliotibial band (ITB) stretch in any position

3.10 Knee extension AROM

3.11 Knee extension PROM in supine

3.12 Knee extension PROM in prone

3.13 Knee flexion AROM

3.14 Knee flexion PROM in sitting or supine

3.15 Knee flexion AROM in any position (rectus femoris stretch)

3.16 Knee flexion PROM in prone (rectus femoris stretch)

3.17 Standing terminal knee extension

Code NO if:

- No mention of flexibility exercise goal generally

- No mention of specific content components interpreted as seeking to improve the flexibility goal

Flexibility note (text =text to support goal and specific content codes)

**4. Balance-Motor Learning-Agility (BMLA)** (binary 0=no; 1=yes)

Code YES (to a BMLA goal) if intervention describes

- BMLA exercise generally

- One or more of the specific content components below and coder interprets that component supports the BMLA goal (also code YES to the specific content binary 0=no; 1=yes)

4.1 Balance in kneeling

4.2 Balance in quadruped

4.3 Balance on unstable surface

4.4 Balance with perturbations

4.5 Ladder drills

4.6 Marching

4.7 Quadruped

4.8 Single leg stance

4.9 Standing weight shifts

4.10 Stepping multiple directions (grapevine)

4.11 Step down

4.12 Step down laterally

4.13 Step lateral (side step)

4.14 Step up – forward

4.15 Step up – lateral

4.16 Tandem standing

4.17 Tandem walking

Code NO if:

- No mention of BMLA goal generally

- No mention of specific content components interpreted as seeking to improve the a BMLA goal

Balance-Motor Learning-Agility note (text =text to support goal and specific content codes)

**5. Task specific training** (binary 0=no; 1=yes)

Code YES (to task specific training goal) if intervention describes

- Task specific training generally

- One or more of the specific content components below and coder interprets that component supports the task specific training goal (also code YES to the specific content binary 0=no; 1=yes)

5.1 Car transfers

5.2 Deadlifts

5.3 Floor-to-sit or Floor-to-stand

5.4 Gait backwards

5.5 Gait downhill

5.6 Gait on uneven surfaces

5.7 Gait sideways

5.8 Gait training

5.9 Gait uphill

5.10 Gait with perturbations

5.11 Gait with resistance

5.12 Obstacle training

5.13 Sit-to-stand training

5.14 Sports specific training

5.15 Stair training

5.16 Treadmill gait

5.17 Treadmill gait (retro)

Code NO if:

- No mention of task specific training goal generally

- No mention of specific content components interpreted as seeking to improve the task specific training goal

Task specific training note (text =text to support goal and specific content codes)

**6. Patient education** (binary 0=no; 1=yes)

Code YES (to patient education goal) if intervention describes

- Patient education generally

- One or more of the specific content components below and coder interprets that component supports the patient education goal (also code YES to the specific content binary 0=no; 1=yes)

6.1 ADLs

6.2 Home exercise program (HEP)

6.3 Life-style change

6.4 Pain management

6.5 Self-management

6.6 Wound care management

Code NO if:

- No mention of patient education goal generally

- No mention of specific content components interpreted as seeking to improve the flexibility goal

Patient education note (text=text to support goal and specific content codes)

**7. Adjunctive modalities** (Binary 0=no; 1=yes)

Code YES (to each adjunctive modality as relevant) if intervention describes the presence of any of the following adjunctive modalities

- Modalities

7.1 Cold

7.2 Heat

7.3 Compression for edema

7.4 E-stim for pain (TENS)

7.5 E-stim for strength (NMES)

7.6 Other modalities for pain

7.7 Ultrasound

7.8 Manual therapy (e.g., therapeutic massage, passive range of motion)

7.9 Contract-relax for knee flexion/extension ROM

7.10 Hold-relax for knee flexion/extension ROM

7.11 Massage for edema control

7.12 Massage for scar mobility

7.13 Massage/myofascial techniques for soft tissue

7.14 Mobilizations – Tibiofemeral

7.15 Mobilizations – Patellar

7.16 Biofeedback devices

7.17 Dry needling

7.18 Mindfulness, stress/anxiety-reduction interventions

7.10 Complementary and alternative therapies (excluding ingested or inhaled treatments)

Code NO if:

- No mention of using adjunctive modality(ies)

**For each arm evaluated in the study, determine:**

**Effect modifiers**

**Progression** (binary 0=no; 1=yes)

Code YES if:

* Study states that progression was a part of the intervention (Code 1=yes; 0=no). May be progression by time and/or patient response.

Code NO if:

* The intervention does not mentioned progression of the intervention.

**Progression\_appropriate** (binary 0=no; 1=yes)

Code YES if:

* The progression program is deemed appropriate based on parameters defined.

Code NO if:

* The progression program is not deemed appropriate based on parameters defined.

Code Unclear if:

* Not enough information to determine Yes or No.

**Progression\_ note** (text=specific description of the details of progression)

**Personnel** (categories)

Indicate personnel who delivered the intervention from the following.

Select all that apply.

* Physical therapist
* Nurse
* Educator
* Peer
* Athletic trainer
* Exercise physiologist
* None (unsupervised)
* Other

**Personnel\_note** (text=specific description of the details of the personnel delivering the intervention)

**Mode\_of\_delivery** (categories)

Indicate mode of how the intervention was delivered.

Select all that apply.

* In-person therapy
* Remote via app
* Remote via web
* Remote via telephone
* Self-guided (unsupervised)

**Mode\_of\_delivery\_note** (text=specific description of the details of how the intervention was delivered)

**Setting** (categories)

Select a prespecified category of where the intervention was delivered.

Select all that apply.

* Acute inpatient (postoperative)
* Other inpatient facility (e.g., skilled nursing facility)
* Physical therapy/rehabilitation facility (outpatient)
* Home
* Gym or other community center
* Other (specify)
* Not reported

**Setting\_note** (text=specific description of where the intervention was delivered)

**Additional intervention comments**

Use to note content of interventions that you think may be relevant/we may want to be aware of but are not of sufficient information, or cross the threshold to warrant coding (e.g., provided supplemental information, esp. in control group, but not really sufficient to count as patient education)

**Concerns/queries**

Use to note other potential methodological concerns separate from the intervention

**Grading the Strength of the Body of Evidence**

We graded the SoE for key outcomes as per the Agency for Healthcare Research and Quality (AHRQ) Methods Guide.4, 5 For each SoE assessment, we considered the number of studies, the study limitations (i.e., risk of bias and overall methodological quality), the directness of the evidence to the KQs, the consistency of study results, the precision of any estimates of effect, the likelihood of reporting bias, other limitations, and the overall findings across studies.

We interpreted **directness** based on the proximity of the outcome to the clinical outcome of interest (i.e., intermediate) and whether the outcome was assessed among the individuals of interest vs. proxy. For example, a patient-reported outcome of function or a performance-based outcome of strength would both be considered direct.

We interpreted **precision** based on the confidence intervals of the individual studies. This is considered appropriate in the GRADE methods “if a meta-analysis is infeasible or inappropriate, reviewers may consider the narrowness of the range of CIs or the significant level of p-values in the individual studies in the evidence base”.5

Based on these assessments, we assigned a SoE rating as being either high, moderate, low, or insufficient to estimate an effect.5 Outcomes with highly imprecise estimates, highly inconsistent findings across studies, or with data from only one study, were deemed to have “insufficient evidence” to allow a conclusion. This overall approach is consistent with the definition of Very Low-quality evidence per GRADE defined as “any estimate of effect is very uncertain”.6

**References for Appendix C**

1. Franklin PD. Defining Components of Physical Therapy Achieving Maximum Function after TKR. Northwestern University at Chicago, Chicago, IL, United States; 2019.

2. Oatis CA, Johnson JK, DeWan T, et al. Characteristics of Usual Physical Therapy Post-Total Knee Replacement and Their Associations With Functional Outcomes. Arthritis Care Res (Hoboken). 2019 Sep;71(9):1171-7. doi: 10.1002/acr.23761. PMID: 30281207.

3. Yang X, Li GH, Wang HJ, et al. Continuous Passive Motion After Total Knee Arthroplasty: A Systematic Review and Meta-analysis of Associated Effects on Clinical Outcomes. Arch Phys Med Rehabil. 2019 Sep;100(9):1763-78. doi: 10.1016/j.apmr.2019.02.001. PMID: 30831093.

4. Berkman ND, Lohr KN, Ansari M, et al. AHRQ Methods for Effective Health Care

Grading the Strength of a Body of Evidence When Assessing Health Care Interventions for the Effective Health Care Program of the Agency for Healthcare Research and Quality: An Update. Methods Guide for Effectiveness and Comparative Effectiveness Reviews. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008.

5. Berkman ND, Lohr KN, Ansari MT, et al. Grading the strength of a body of evidence when assessing health care interventions: an EPC update. J Clin Epidemiol. 2015 Nov;68(11):1312-24. doi: 10.1016/j.jclinepi.2014.11.023. PMID: 25721570.

6. Atkins D, Best D, Briss PA, et al. Grading quality of evidence and strength of recommendations. Bmj. 2004 Jun 19;328(7454):1490. doi: 10.1136/bmj.328.7454.1490. PMID: 15205295.

**Appendix D. Literature Flow Diagram**



Abbreviations: CPG = clinical practice guideline, D = (study) design, I = (study) intervention, KQ = Key Question, MJR = major joint replacement, NRCS = nonrandomized comparative study, O = (study) outcomes, P = (study) population, SEAD = supplemental evidence and data (request), SR = systematic review, T = (outcome) timing, THA = total hip arthroplasty, TKA = total knee arthroplasty.

\* 1 study included for both KQs 1 and 2, 1 study included for both KQs 1 and 3, 2 studies included for both KQs 2 and 4.

**Appendix E. Design details and arm characteristics for rehabilitation for total knee arthroplasty**

| **StudyA, Year,**  **PMID,**  **Country** | **Funding Source** | **Risk of Bias** | **Eligibility Criteria** | **Intervention**B | **N, Enrolled** | **Mean Age, Years (SD)** | **Female, %** | **Mean BMIC (SD)** | **Prior Contralateral Athroplasty** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | NR | High | INCLUSION: Patients who underwent TKR. EXCLUSION: NR | Technological assisted rehabilitation  Comp: -  AdjMod: -  Set: H | 155 (all participants) | NR | NR | NR | NR |
| No data | No data | No data | Supervised rehabilitation  Comp: 0  AdjMod: -  Set: O | 155 (all participants) | NR | NR | NR | NR |
| Artz, 2017, 27068368, UK | Non-industry | High | INCLUSION: Patients undergoing a primary TKR for OA were eligible for participation in the study. EXCLUSION: Exclusion criteria included: knee replacement for conditions other than osteoarthritis, revision knee surgery, inability to participate in exercise for any medical reason such as unstable cardiovascular or cardio-respiratory disease, diagnosis of severe neurological disorders, inability to provide informed consent. | 6 outpatient group-based exercise sessions  Comp: S-A-B-T-E  AdjMod: -  Set: O | 23 | 70.0 (57, 81) | 52% | NR | NR |
| No data | No data | No data | Usual care  Comp: -  AdjMod: -  Set: - | 23 | 67.2 (51, 82) | 52% | NR | NR |
| Avramidis, 2011, 21410130, Greece | NR | Moderate | INCLUSION: good mental health, unilateral knee osteoarthritis with Kellgren- Lawrence radiographic severity18 2, and age between 60 and 75 years. EXCLUSION: rheumatoid arthritis, symptomatic osteoarthritis of other big joints of the lower extremities, history of epilepsy, a cardiac pacemaker, poor understanding of the use of the stimulator, and lesions of the skin over the vastus medialis and lateral part of the thigh. | TENS plus Physiotherapy  Comp: S-F-T  AdjMod: NMES  Set: I | 38 | 70.54 (4.68) | 80% | 27.38 (2.65) | NR |
| No data | No data | No data | Physiotherapy  Comp: S-F-T  AdjMod: -  Set: I | 38 | 70.66 (3.73) | 83% | 27.14 (3.31) | NR |
| Bade, 2017, 27813347, USA | Non-industry | Moderate | INCLUSION: Patients underwent a primary, unilateral TKA secondary to knee OA and were ages 50-85 years. EXCLUSION: Current smoker, current cancer treatment, uncontrolled diabetes mellitus (glycosylated haemoglobin level .7.0), body mass index .40 kg/m2, neurologic, vascular, or cardiac problems that limited function, discharge to location other than home after surgery (e.g., skilled nursing facility), or severe contra- lateral knee OA (pain level .5 of 10 with stair climbing) or other orthopaedic conditions that limited function and necessitated alternative concurrent intervention (e.g., severe lumbar spinal stenosis, severe hip or ankle OA). | High-intensity progressive rehabilitation  Comp: S-A-F-B-T-E  AdjMod: Massage, mobilization  Set: O, H | 84 | 63 (8) | 54% | 31 (5) | NR |
| No data | No data | No data | Low-intensity rehabilitation  Comp: S-A-F-B-T-E  AdjMod: Massage, mobilization, heat, cold  Set: O, H | 78 | 64 (7) | 56% | 30 (5) | NR |
| Bily, 2016, 26763947, Austria | Non-industry | High | INCLUSION: Subjects scheduled for their first TKA. EXCLUSION: Patients who might face a high health risk during maximum strength measurement in the context of this study. Other specific exclusion criteria were body mass index >40kg/m2; previous knee replacement; pain in the contralateral leg >5 VAS recent deep vein thrombosis or any infection; myopathy; neurologic, pulmonary, or symptomatic cardiovascular diseases; vertigo or impaired cognitive function; recent or past cancer; rheumatism; or any other relevant limitations of the musculoskeletal system | Leg-press group  Comp: S  AdjMod: -  Set: O, H | 31 | 68.3 (6.7) | 69% | 28 (3.8) | NR |
| No data | No data | No data | Physiotherapy group  Comp: S-F-T  AdjMod: Massage, mobilization  Set: O, H | 31 | 64.9 (6.0) | 65% | 28.7 (4.1) | NR |
| Bruun-Olsen, 2013, 23614370, Norway | Non-industry | Moderate | INCLUSION: Elective primary TKA at two local county hospitals in Norway. OA of the knee according to diagnostic criteria, residence close to the hospitals so as to be able to attend the training sessions. EXCLUSION: Other walking impairments than those related to their operated knee, patients with rheumatoid arthritis, severe osteoarthritis in the hips or contra lateral knee, neurological diseases, dementia, as well as those with a history of drug abuse | Walking-skill group  Comp: S-A-F-B-T  AdjMod: -  Set: O | 29 | 68 (8) | 62% | 28 (6) | NR |
| No data | No data | No data | Usual physiotherapy care  Comp: S  AdjMod: -  Set: O | 28 | 69 (10) | 50% | 29 (5) | NR |
| Buhagiar , 2017, 28291891, Australia | Non-industry | Moderate | INCLUSION: >= 40 years with a primary diagnosis of OA and to undergo a primary, unilateral TKA. EXCLUSION: Predisposition to be discharged to an inpatient rehabilitation facility due to lack of social support (lack of an able caregiver); having other major coexisting physical impairments such as hemiplegia or amputation; and unable to perform a home exercise program without support from another person. | Home Program  Comp: S-A-F-B-E  AdjMod: -  Set: H, self-guided | 81 | 66.9 (9) | 68% | 34.8 (7) | NR |
| No data | No data | No data | Hospital Inpatient Rehabilitation  Comp: S-A-F-B-E  AdjMod: -  Set: H | 84 | 66.9 (8) | 69% | 34.7 (7) | NR |
| Cai, 2018, 29239772, China | NR | Moderate | INCLUSION: post unilateral TKA for knee OA, >45 years, high level of kinesiophobia based on a score >37 on the Tamps Scale for Kinesiophobia (TSK). EXCLUSION: neurologic disorder, psychiatric or psychological disorder, prior knee surgery, history of patellar luxation, torn meniscus, or ligament injury, scheduled for revision know arthroplasty, had previously participated in a CBT intervention. | Cognitive behavioral therapy (CBT) plus standard care  Comp: E  AdjMod: mindfulness, stress/anxiety-reduction interventions  Set: I | 50 | 65.26 (8.30) | 64% | 26.52 (2.78) | NR |
| No data | No data | No data | Standard care  Comp: -  AdjMod: -  Set: - | 50 | 66.18 (7.04) | 60% | 26.63 (4.74) | NR |
| Chan, 2018, 29372260, SingaporeD | NR | Moderate | INCLUSION: Patients who underwent primary unilateral TKA and had a primary diagnosis of OA. EXCLUSION: Patients who underwent revision TKA or contralateral leg TKA within two years of primary TKA, or did not complete at least six months of follow-up | Discharge to home  Comp: -  AdjMod: -  Set: H | 103 | 67.2 (7.8) | 78% | 27.9 (4.8) | NR |
| No data | No data | No data | Discharge to community hospitals  Comp: -  AdjMod: -  Set: I | 1,017 | 70.7 (7.6) | 87% | 27.3 (5.0) | NR |
| DeJong,  2020,  32360105  USA | Industry | High | INCLUSION: (1) had undergone an elective unilateral TKA and initiated outpatient PT <24 days post-TKA; (2) >40 yo; and (3) weighed less than 300 pounds (due to the weight limitation for the body weight-adjustable treadmill).  EXCLUSION: (1) undergone a lower extremity joint replacement procedure, including a revision, second, or bilateral TKA or THA <1 yr prior to their current TKA; (2) whose payer was workers’ compensation; (3) who were in litigation related to injury or disease associated with their current TKA; (4) who were pregnant or may be pregnant; (5) who had a medical history of neurologic disorders, RA, or gout (unless <6 mo since last exacerbation or flare up and under control medically); (6) who were under active cancer treatment with history of malignancy in either or both lower extremities, or with evidence of signs or symptoms of cancer, chemotherapy, or radiation <1 yr prior to their current TKA; (7) who developed DVT post-TKA; (8) who were unable to proceed or continue the planned outpatient program because of complications such as wound infection related to the TKA and severe orthostatic hypotension; (9) who required manipulation under anaesthesia post-TKA; and (10) who received >2 wks of other care in another post-acute setting prior to outpatient PT. | Body-weight adjusted treatment  Comp: S-F-T  Adj: Cold  Set: O | 76 | 64.9 (7.7) | 58% | 31.2 (6.4) | 15.4 |
| No data | No data | No data | Recumbent bike & PENS  Comp: S-F  Adj: Cold, NMES  Set: O | 78 | 62.9 (8.0) | 64% | 32.2 (6.5) | 15.6 |
| No data | No data | No data | Body-weight adjusted treadmill & PENS  Comp: S-F-T  Adj: Cold, NMES  Set: O | 70 | 62.7 (7.7) | 59% | 31.4 (5.7) | 15.6 |
| No data | No data | No data | Recumbent bike  Comp: S-F  Adj: Cold  Set: O | 74 | 62.8 (8.3) | 58% | 31.5 (5.8) | 22.8 |
| Demircioglu, 2015, 26355656, Turkey | NR | High | INCLUSION: knee OA who were admitted to the Orthopaedia and Traumatology outpatient clinic for TKA of the Istanbul Physical Medicine and Rehabilitation Training Hospital, Istanbul, Turkey between 01-September-2006 and 01-April-2007. EXCLUSION: Symptomatic hip osteoarthritis, concomitant cardiac or internal diseases precluding surgical treatment, a history of epilepsy, the presence of a pacemaker, a skin lesion over the quadriceps muscle that required electrode application, muscle atrophy, or severe cognitive dysfunction. | NMES & exercise  Comp: S-F  AdjMod: Cold, NMES, mobilizations  Set: O | 30 | 66.2 (7.8) | 93% | 29.1 (3.9) | NR |
| No data | No data | No data | Exercise  Comp: S-F  AdjMod: cold, mobilization  Set: H | 30 | 64.6 (6.6) | 97% | 30.1 (4.6) | NR |
| den Hertog, 2012, 22643801, Germany | Industry | Moderate | INCLUSION: Male and female patients (age range 40 85 years), admitted for elective TKA. EXCLUSION: Lack of cooperation capability, American Society of Anaesthesiologists (ASA) score [3, rheumatoid arthritis, cancer co-morbidity, alcohol or drug abuse, previous major surgery on the affected joint, neurologic or psychiatric dis- ease, pregnancy, and participation in other clinical studies | Fast-track rehabilitation program  Comp: S-F-T-E  AdjMod: -  Set: I | 74 | 68.25 (7.91) | 73% | 30.38 (6.05) | NR |
| No data | No data | No data | Standard care  Comp: S-F-T  AdjMod: -  Set: I | 73 | 66.58 (8.21) | 69% | 31.17 (5.82) | NR |
| Eymir,  2020,  32778907  Turkey | NR | High | INCLUSION: > 30yo and were scheduled for unilateral primary TKA. EXCLUSION: required urgent intervention, had a previous orthopaedic, neurological, cardiac disorder or surgery  that causes gait disturbance, had a BMI  greater than 40 kg/m2, or were planned for bilateral, revision or cementless TKA surgery. | Active heel-slide exercise & standard physical therapy Comp: S-F-T  Adj: -  Set: AI; H | 58 | 68.9 (8.9) | 85% | 31.6 (4.5) | NR |
| No data | No data | No data | Continuous passive motion & standard physical therapy  Comp: S-F-T  Adj: -  Set: AI; H | 55 | 68.9 (8.3) | 91% | 31.3 (4.3) | NR |
| Fransen, 2017, 27868384, Australia | Non-industry | Moderate | INCLUSION: 45 74 years, undergoing unilateral or bilateral primary TKR, and able to be discharged home from the orthopedic ward. EXCLUSION: Previous unicompartmental replacement or tibial osteotomy on the same knee, major comorbidity precluding aerobic exercise at 50 60% maximum heart rate, or a diagnosis of rheumatoid arthritis or a major neurologic condition. | Outpatient group exercise  Comp: S-A-F-T-E  AdjMod: -  Set: O, H | 210 | 64 (6.5) | 54% | 32.2 (5.6) | 13% |
| No data | No data | No data | Usual care  Comp: -  AdjMod: -  Set: O, H | 212 | 65.2 (6) | 52% | 31.7 (6.7) | 17% |
| Hamilton, 2020, 33051212, UK | Non-industry | Moderate | INCLUSION: have undergone a primary TKA for OA, at risk for a poor outcome (defined as Oxford knee score ≤26  points completed at 6 wks postoperative assessment). EXCLUSION: unwilling to comply rehabilitation protocols,  underwent arthroplasty purely for pain relief (ie, those with no expectation of mobilising postoperatively),required complex revision procedures, could not,  or were unwilling to, attend their local outpatient department for rehabilitation, or had already received structured ongoing outpatient physiotherapy at six  weeks post-surgery. | Outpatient therapist-led rehabilitation  Comp: S-F-E  AdjMod: -  Set: H | 163 | 66.8 (6.49) | 59% | 31.19 (5.30) | NR |
| No data | No data | No data | Physiotherapy review & home exercises (standard of care)  Comp: S-A-F-B-T-E  AdjMod: -  Set: O, H | 171 | 68.2 (9.44) | 62% | 31.50 (6.18) | NR |
| Harmer, 2009, 19177536, Australia | Non-industry | Moderate | INCLUSION: Primary TKR. EXCLUSION: Postoperative deep joint infection, bilateral joint surgery or surgery planned for another joint within 6 months, and documented dementia or other neurologic condition that precluded informed consent | Water-based rehabilitation  Comp: S-A-F-E  AdjMod: -  Set: H | 53 | 68.7 (9.1) | 57% | 31.6 (5.8) | NR |
| No data | No data | No data | Land-based rehabilitation  Comp: F-B-E  AdjMod: -  Set: O, H | 49 | 67.8 (6.3) | 57% | 30.6 (5) | NR |
| Heikkilä, 2017, 28119232, Finland | NR | High | INCLUSION: 1) diagnosed knee OA, 2) primary arthroplasty of the knee in question, and 3) age over 18 years. EXCLUSION: ) other surgery for lower limbs planned to be carried out within 12 months, 2) dementia, 3) other serious co-morbidities preventing active training, and 4) difficulty in visiting a physiotherapist due to long travelling distance. | Home exercise  Comp: S-F-B-E  AdjMod: -  Set: H, O | 51 | 69 (8) | 57% | Missing | 28% |
| No data | No data | No data | Control  Comp: -  AdjMod: -  Set: - | 53 | Missing? | 65% | 69 (8) | 31% |
| Iwakiri,  2020,  32373475  Japan | NR | High | INCLUSION: Unilateral TKAs  EXCLUSION: Patients with renal insufficiency, a history of cardiac disease, deep vein thrombosis, or surgery of the knee joint; patients who were scheduled for simultaneous or staged bilateral TKA or for revision TKA. | Range of motion (post op day 1)  Comp: F-T  AdjMod: -  Set: AI; H | 55 | 75.0 (7.3) | 82% | 24.5 (4.2) | NR |
| No data | No data | No data | Range of motion (post op day 7)  Comp: F-T  AdjMod: -  Set: AI | 54 | 75.6 (6.2) | 82% | 25.2 (3.7) | NR |
| Jin, 2018, CN-01617489, China | NR | High | INCLUSION: OA, unilateral TKA for the first time, informed content was obtained. EXCLUSION: Overweight (BMI>/= 30 kg/m2), severe osteoporosis, ligament injury or periprosthetic fracture occurring during TKA, Unstable vital signs, complications of incision healing, or clot formation in leg veins, Vision loss, hearing loss, or functional illiteracy. | VR plus usual care  Comp: S-F-E  AdjMod: biofeedback, mindfulness, stress reduction interventions  Set: I | 33 | 66.45 (3.49) | 55% | 24.52 (2.27) | NR |
| No data | No data | No data | Usual care  Comp: S-F-E  AdjMod: mindfulness, dstress reduction interventions  Set: I | 33 | 66.30 (4.41) | 61% | 24.97 (2.52) | NR |
| Kauppila, 2010, 20354057, Finland | Non-industry | Moderate | INCLUSION: (1) diagnosis of primary osteoarthritis of the knee; (2) 60 80 years of age; and (3) primary unilateral total knee arthroplasty as a scheduled procedure. EXCLUSION: (1) severe cardiovascular or pulmonary disease (New York Heart Association III IV), (2) severe dementia (Mini-Mental State Examination 518),19 (3) rheumatoid arthritis, (4) primary total knee arthroplasty scheduled as treatment of an acute trauma of the knee, (5) planned use of a special endoprosthesis, and (6) major postoperative complication as a contraindication for intensive rehabilitation | Multidisciplinary rehabilitation  Comp: S-A-F-T-E  AdjMod: mindfulness, stress and anxiety reduction interventions  Set: I, O, H | 36 | 70.7 (5.7) | 76% | 32.9 (6.8) | 18.2% |
| No data | No data | No data | Control  Comp: S-F-T-E  AdjMod: -  Set: I, O, H | 39 | 70.6 (5.3) | 79% | 32 (4.4) | 16.7% |
| Lenguerrand, 2020, 31033232, UK | Non-industry | Moderate | INCLUSION: National Health Services patients >= 18 years who are listed for primary TKR due to OA.EXCLUSION: Patients listed for TKR for reasons other than OA, patients listed for revision TKR, inability to participate in exercise for medical reasons such as unstable cardiovascular or severe neurological conditions, unable or unwilling to attend physiotherapy classes after surgery, post-operative complication(s) or interventions within the first 2 weeks. | Group-based outpatient physical therapy and standard care  Comp: S-A-F-B-T-E  AdjMod: -  Set: O | 89 | 69 (9) | 56% | NR | NR |
| No data | No data | No data | Standard care  Comp: -  AdjMod: -  Set: NA | 91 | 69 (9) | 54% | NR | NR |
| Lenssen, 2006, 16942627, Netherlands | NR | Moderate | INCLUSION: scheduled in the 'Joint Care' program and signed an informed consent form. EXCLUSION: >85 years, comorbidity influencing gait, patients who did not speak dutch | Physiotherapy [twice daily (40 mins/day)]  Comp: S-F-T  AdjMod: -  Set: I | 21 | 70 (8.5) | 71% | NR | NR |
| . | . | . | Physiotherapy [once daily (20 mins/day)]  Comp: S-F-T  AdjMod: -  Set: I | 22 | 67 (7) | 77% | NR | NR |
| Li, 2014, 23412304, China | Non-industry | High | INCLUSION: (1) no neural or muscular system disease, (2) unilateral OA knee joint TKR, and (3) able to walk safely and independently and functional ambulation (FAC) score C 3. EXCLUSION: (1) mental disease, dementia, and intelligence impairment before OA and a history of cerebral organic disease and of mental disorders (mini mental state evaluation score \ 23), (2) cardiopulmonary functional lability, (3) serious cardiac and renal dysfunction and hemopathicactive peptic ulcer, and (4) other medical and surgical diseases which may lead to hemorrhage | Robot-assisted training  Comp: S-F-T  AdjMod: NMES  Set: I | 60 (all participants) | NR | NR | NR | NR |
| No data | No data | No data | Traditional rehabilitation training  Comp: S-F-T  AdjMod: NMES  Set: I |  | NR | NR | NR | NR |
| Li, 2015, CN-01084888, China | NR | High | INCLUSION: Age between 55 and 75; the diagnosis was knee osteoarthritis with the Kellgren/Lawrence grade 4; the body mass index (BMI) was less than 35; affected by the unilateral knee OA undergoing primary knee TKA; living in Beijing. EXCLUSION: Infectious joint diseases; hip joint disease or ankle joint disease which affected the daily physical activities; comorbidities such as chronic obstructive pulmonary disease which affected the daily physical activities | Functional plus balance rehabilitation  Comp: E  AdjMod: -  Set: H | 25 | 71.43 (6.33) | 75% | 27.88 (5.02) | NR |
| No data | No data | No data | No education  Comp: -  AdjMod: -  Set: - | 25 | 73.40 (7.04) | 65% | 26.97 (4.15) | NR |
| Li, 2017, CN-01419703, China | NR | Moderate | INCLUSION: (1) Patients undergoing TKR for the first time with a unilateral knee joint; (2) The surgery of the patients was performed by the same group of doctors and the same anesthesiologist, and the same manufacturer and the same material prosthesis were selected; (3) Other factors such as trauma, arthritis and other diseases were excluded; (4) Patients and their families indicate good medical compliance and strong willingness to participate. EXCLUSION: (1) Patients with sequelae of cerebrovascular disease; (2) Mental illness and intellectual disability cannot cooperate; (3) Patients with severe liver, kidney, heart, and lung insufficiency, tumors; (4) TKR has joint infection, joint tuberculosis or acute, Chronic osteomyelitis, or combined with serious medical diseases that restrict walking, and other joint diseases of the lower extremities cause severe deformities and restricted mobility | Gait training & usual care  Comp: S-F-B-T  AdjMod: Cold, massage for edema control  Set: I | 24 | 76.33 (5.28) | 56% | NR | NR |
| No data | No data | No data | Usual care  Comp: S-F-B  AdjMod: Cold, massage for edema control  Set: I | 22 | 78.47 (5.50) | 51% | NR | NR |
| Li, 2019, 31003647, China | Non-industry | Moderate | INCLUSION: (a) clinical and radiographic evidence diagnosed with end- stage knee OA according to the diagnosis criteria and scheduled for primary unilateral TKA surgery; (b) 65-74 years of age; (c) no history of significant cardiovascular, pulmonary, metabolic, musculoskeletal, or other chronic diseases; (d) fully informed consent about the program; (e) a partner to oversee the entire exercise process to ensure safety; and (f) a normally active lifestyle. EXCLUSION: (a) a history of knee infection, a lesion involving bilateral knees, or any intra-articular hyaluronic acid injections in the 6 months prior to assessment; (b) serious medical conditions that limited his/her ability to safely participate in either the TCC or physical therapy programs; (c) inability to walk at least 150 m in 6 min due to some serious diseases (e.g., epilepsy, diminished mental capabilities); (d) previous experience with TCC or exercised regularly with other similar types of complementary and alternative medicine such as qi gong or yoga; or (e) inability to complete the study (e.g., not Chinese-speaking or intended to move out of the region) | Tai chi exercise  Comp: S-F  AdjMod: complementary and alternative therapies  Set: NR | 64 | 69.6 (4.3) | 52% | 23.7 (3.6) | NR |
| No data | No data | No data | Control (traditional physical exercises)  Comp: S-F  AdjMod: -  Set: NR | 65 | 68.5 (3.5) | 55% | 24.2 (2.9) | NR |
| Liao, 2015, 25552523, Taiwan | Non-industry | High | INCLUSION: OA. EXCLUSION: NR | Functional rehabilitation & balance training  Comp: S-A-F-B-T  AdjMod: -  Set: O | 53 | 71.43 (6.33) | 75% | 27.88 (5.02) | NR |
| No data | No data | No data | Functional rehabilitation  Comp: S-A-F-T  AdjMod: -  Set: O | 55 | 73.40 (7.04) | 65% | 26.97 (4.15) | NR |
| Liao, 2020, 31687984, Taiwan | Non-industry | Moderate | INCLUSION: (a) older women aged 60 and 85 yrs, (b) radiological diagnosis of KOA (Kellgren and Lawrence grade III or higher), and (c) scheduled to undergo a primary TKR. EXCLUSION: (a) uncontrolled hypertension, (b) any cardiovascular or pulmonary disease that would prevent them from engaging in an exercise study, and (c) neurological or cognitive impairment that may interfere with compliance with and adherence to a home-based exercise program. | Elastic resistance exercise training  Comp: S-F  AdjMod: -  Set: O, H | 28 | 72.22 (7.75) | 100% | 28.54 (3.88) | NR |
| No data | No data | No data | Standard care  Comp: -  AdjMod: -  Set: NR | 27 | 69.79 (6.72) | 100% | 27.25 (4.36) | NR |
| Liebs, 2010, 20360503, Germany | Non-industry | Moderate | INCLUSION: Primary unilateral TKR on an elective basis after a diagnosis of OA or osteonecrosis. EXCLUSION: History of septic arthritis, a hip or knee fracture, an intraoperative complication, revision arthroplasty, RA, (6) lower extremity amputation, a malignant tumor.  NB. Knee population reported here | Ergometer cycling  Comp: S-F-B-T  AdjMod: -  Set: O | 85 | 69.7 (8) | 62% | 29.7 (4.8) | NR |
| No data | No data | No data | Control  Comp: S-F-B-T  AdjMod: -  Set: O | 74 | 69.9 (7.8) | 52% | 29.2 (4.4) | NR |
| Liebs, 2012, 22196125, Germany | Non-industry | Moderate | INCLUSION: Unilateral hip or knee replacement surgery at participating centers on an elective basis after diagnosis of OA. EXCLUSION: History of septic arthritis, hip or knee fracture, intraoperative complications, revision arthroplasty, RA, amputations, malignancy | Early aquatic therapy  Comp: S-F-B-T  AdjMod: -  Set: O | 66 | 68.5 (8.6) | 61% | 29.3 (5) | NR |
| No data | No data | No data | Late aquatic therapy  Comp: S-F-B-T  AdjMod: -  Set: O | 69 | 70.9 (7.5) | 72% | 29.3 (4.6) | NR |
| Madsen, 2013, 23651717, Denmark | Non-industry | High | INCLUSION: 1) age 18 years or more, 2) primary TKA for osteoarthritis, 3) patient living in one of three municipalities, 4) patient able to travel to the rehabilitation centre independently. EXCLUSION: 1) neuromuscular or neurodegenerative diseases, 2) knee infection after TKA or other major complications (e.g. loosening or embolism excluding superficial thrombophlebitis), 3) problems related to mobility, muscle strength or excessive pain preventing the patient from following the rehabilitation program, 4) patient unable to understand the instructions due to dementia or language problems | Group-based rehabilitation  Comp: S-A-F-B-E  AdjMod:  Set:O, H | 47 | 66.9 (8.5) | 47% | NR | NR |
| No data | No data | No data | Supervised home-exercises  Comp: S-A-B-E  AdjMod: -  Set: O, H | 50 | 66.2 (8.2) | 50% | NR | NR |
| Minns Lowe, 2012, 22180446, UK | No industry | High | INCLUSION: Patients undergoing elective primary total knee arthroplasty for OA. EXCLUSION: Bilateral arthroplasty, planned unicompartmental prosthesis, minimally invasive surgery, planned further joint surgery within 12 months, inflammatory arthritis, existing comorbidities preventing participation in treatment | Home-visit physiotherapy  Comp: S-F-B-T  AdjMod: -  Set: H | 56 | 67.84 (8.45) | 57% | 31.32 (6.28) | 38.2% |
| No data | No data | No data | Usual care  Comp: -  AdjMod:-  Set:- | 51 | 70.76 (9.45) | 59% | 29.27 (5.82) | 43.1% |
| Mitchell, 2005, 15869558, UK | Non-industry | High | INCLUSION: primary unilateral TKA for OA. EXCLUSION: revision TKA, bilateral and unicondylar knee replacements, TKA for trauma, onset of serious comorbidity or terminal illness since patient placed on the waiting list, contralateral knee replacement within the preceding 12 months | Home rehabilitation  Comp: F-T  AdjMod: Massage  Set: H | 80 | 70.0 (7.2) | 63% | NR | 15.8% |
| No data | No data | No data | Hospital rehabilitation  Comp: F-T  AdjMod: -  Set: O | 81 | 70.6 (8.2) | 53% | NR | 26.4% |
| Moffet, 2015, 26178888, Canada | Non-industry | Moderate | INCLUSION: Waiting for a primary TKA after a diagnosis of OA, returning home after hospital discharge, living in an area served by high-speed Internet services (at least 512 kb/s in upload), and living within a 1-hour driving distance from the treating hospital. EXCLUSION: Health conditions that could interfere with tests or the rehab program, including other lower-limb surgery in the last 9 months; were planning a second lower-limb surgery within 4 months; had cognitive or collaboration problems; had major post-op complications; or had weight-bearing restrictions for a period longer than 2 weeks after surgery. | In-home telerehabilitation  Comp: S-B-T-E  AdjMod: -  Set: H | 104 | 65 (8) | 58% | 34 (7) | NR |
| No data | No data | No data | Standard home rehabilitation  Comp: S-T-E  AdjMod: -  Set: H | 101 | 67 (8) | 45% | 33 (6) | NR |
| Monticone, 2013, 23063624, Italy | NR | Moderate | INCLUSION: Primary TKA because of knee OA performed 7 to 10 days before admission to our rehabilitation unit, a good understanding of Italian, and aged >50 years. EXCLUSION: Cognitive impairment and all other causes of knee pain, such as previous lower limb surgery, infection, fracture, osteonecrosis or malignancy, and systemic or neuromuscular diseases. Any subjects receiving compensation for work-related disabilities or who had previously participated in a cognitive- behavioural intervention | Home-based functional exercises and kinesiophobia training  Comp: S-F-B-T-E  AdjMod: mindfulness, stress, anxiety reduction interventions  Set: H, I | 55 | 67 (6.1) | 66% | 28 (3.4) | NR |
| No data | No data | No data | Usual care  Comp: S-F-B-T  AdjMod: -  Set: I | 55 | 68 (7.1) | 62% | 28.3 (5) | NR |
| Moutzouri, 2018, 29473481, Greece | Non-industry | Moderate | INCLUSION: Participants were that they had elected to undergo primary unilateral total knee replacement as a result of advanced osteoarthritis and they had been ambulatory at the time of surgery. EXCLUSION: (a) neurological conditions; (b) vestibular disorders that might affect balance; (c) other lower extremity orthopaedic problems | Early self-managed focal sensorimotor rehabilitative training  Comp: S-A-F-B-T  AdjMod: -  Set: H | 26 | 71.3 (5.3) | NR | NR | NR |
| No data | No data | No data | Functional exercise training  Comp: S-A-F-T  AdjMod: -  Set: H | 25 | 72.3 (5.6) | NR | NR | NR |
| Naylor, 2017, 28899328, Australia | Non-industry | High | INCLUSION: awaiting arthroplasty secondary to OA, primary TKA, private insurance. EXCLUSION: patients referred to inpatient rehabilitation because of slow progress, and those who had conditions that would alter their typical recovery and rehabilitation pathway, such as simultaneous bilateral surgeries, as well as those who experienced a significant complication within 90 days of surgery | Inpatient rehabilitation  Comp: -  AdjMod: -  Set: I | 185 | 68.9 (8.9) | 37% | 30.6 (5.9) | NR |
| No data | No data | No data | No inpatient rehabilitation  Comp: -  AdjMod: -  Set: NR (assumed home) | 147 | 67.2 (7.3) | 51% | 30.7 (5.1) | NR |
| Padgett, 2018, 29352683, USAD | NR | Moderate | INCLUSION: Patients undergoing primary unilateral TKA with a diagnosis of osteoarthritis with or without inflammatory disorders. EXCLUSION: Patients with a diagnosis of post-traumatic osteoarthritis | Discharged to home  Comp: -  AdjMod: -  Set: H | 1213 | NR | NR | NR | NR |
| No data | No data | No data | Discharged to long term care facility  Comp: -  AdjMod:-  Set: I | 1213 | NR | NR | NR | NR |
| No data | No data | No data | Discharged to inpatient rehabilitation  Comp: -  AdjMod:-  Set: I | 492 | NR | NR | NR | NR |
| Petersen, 2018, 29294078, Netherlands | Non-industry | Moderate | INCLUSION: Hemi, or total, knee replacement and 18 70 years. EXCLUSION: Serious medical conditions that would influence rehabilitation (i.e., hip dysfunction, myocardial diseases, or inflammatory arthritis), current use of anticoagulants, infection | Exercise & acupuncture  Comp: S-A-F-B-T  AdjMod: Dry needling  Set: O | 87 | 56 (8) | 56% | NR | NR |
| No data | No data | No data | Exercise  Comp: S-A-F-B-T  AdjMod: -  Set: O | 85 | 56 (6.8) | 61% | NR | NR |
| Petterson, 2009, 19177542, USA | Non-industry | High | INCLUSION: Ages 50-85 years scheduled to undergo unilateral TKA. EXCLUSION: 1) uncontrolled hypertension, 2) diabetes, 3) body mass index (BMI) 40 kg/m2 (20), 4) symptomatic OA in the contralateral knee (defined as self-reported knee pain >4 on a 10-point verbal analog scale), 5) other lower extremity orthopedic problems limiting function, 6) neurologic impairment, or 7) a residence outside of a 20-mile radius of the clinic | Exercise & NMES  Comp: S-F-T  AdjMod: NMES, massage, mobilizations  Set: O | 100 | 65.3 (8.3) | 47% | 29.67 (4.85) | NR |
| No data | No data | No data | Exercise  Comp: S-F-T  AdjMod: Massage, mobilizations  Set: O | 100 | 65.2 (8.5) | 45% | 29.99 (3.90) | NR |
| Piqueras, 2013, 23474735, Spain | Industry | Moderate | INCLUSION: Successful primary TKA surgery; post-TKA active range of motion: flexion 80 degrees and extension 10 degrees, without signs of stiffness; ability to walk with the use of a walking aid. EXCLUSION: Sensory, cognitive and/or praxic impairment; concomitant medical conditions that may influence the rehabilitation process; discharge to destination other than home; patients with any local or systemic complication (e.g. surgical wound infection, suspicion of deep vein thrombosis) in the 3 month follow- up period | Interactive virtual telerehabilitation system  Comp: S-F-T-E  AdjMod: -  Set: H | 72 | NR | 63% | NR | NR |
| No data | No data | No data | Conventional outpatient physical therapy  Comp: S-F-T  AdjMod: -  Set: I, O | 70 | NR | 83% | NR | NR |
| Piva, 2017, 28217891, USA | Non-industry | Moderate | INCLUSION: Subjects who were ages 50 years, had unilateral TKR done 3 to 6 months prior to starting the study, had medical clearance from the knee surgeon to participate in the study, and were English speakers. EXCLUSION: Bilateral or revision TKR, previous hip or ankle joint replacement, regular participation in exercise programs (>2 times a week), inability to ambulate 30 meters without an assistive device, 2 or more falls within the past year, acute illness, severe visual impairment, lower-leg amputation, uncontrolled diabetes mellitus, and other neurologic, muscular, and cardiovascular diseases that could confound the results or prevent safe exercise participation | Comprehensive behavioral intervention  Comp: S-A-F-B-T-E  AdjMod: -  Set: O, H | 22 | 68.1 (7.5) | 82% | 31.2 (3.6) | NR |
| No data | No data | No data | Standard care exercise  Comp: S-A-F-E  AdjMod: -  Set: O, H | 22 | 68.3 (5.5) | 59% | 29.3 (4.1) | NR |
| Piva, 2019, 30794296, USA | Non-industry | Moderate | INCLUSION: Unilateral primary TKR, >= 60 years, TKR 2-4 mo before screening, moderate functional limitations defined by a WOMAC-PF >=9, medical clearance to exercise. EXCLUSION: Contraindications to exercise, neuromuscular disorders of the lower extremities, inability to independently walk 50 m, terminal illness, intent to undergo another TKR. | Community-based exercise group  Comp: S-A-F-B-T  AdjMod: -  Set: Gym, community centre | 96 | 70 (7) | 60% | 31.3 (6.3) | NR |
| No data | No data | No data | Clinic-based individual physical therapy exercise  Comp: S-A-B-T-E  AdjMod: -  Set: O | 96 | 69 (6) | 62% | 30.8 (5.3) | NR |
| No data | No data | No data | Standard care  Comp: -  AdjMod: -  Set: - | 48 | 70 (7) | 65% | 31.5 (5.1) | NR |
| Pua, 2017, 27810379, SingaporeD | Non-industry | Moderate | INCLUSION: Patients age >/=50 years who underwent a primary TKA and were discharged home non-missing follow-up (6 months). EXCLUSION: Patients who had a history of rheumatoid arthritis and patients with stroke or Parkinson's disease | Rehabilitation attendance: two or more sessions  Comp: S-A-F-B-T-E  AdjMod: cold, NMES  Set: O | 1386 | 67.1 (7.5); Median SUBVALUE(66.8) | 76% | 27.3 (4.4) | NR |
| No data | No data | No data | Rehabilitation attendance: once  Comp: S-A-F-B-T-E  AdjMod: cold, NMES  Set: O | 86 | 70 (7.3); Median SUBVALUE(71.2) | 77% | 28.5 (4.9) | NR |
| No data | No data | No data | Rehabilitation attendance: none  Comp: -  AdjMod: -  Set: - | 68 | 70.8 (8.1); Median SUBVALUE(71.5) | 74% | 27 (4.9) | NR |
| Rockstroh, 2010, 20533147, Germany | Industry | High | INCLUSION: age <= 85; had TKA and were treated with inpatient rehab at the Klinik Bavaria Kreischa. EXCLUSION: people with thrombosis, cardiopulmonary insufficiency, tumors, infections, skin diseases, rheumatism, alcohol or drug abuse, ongoing pension request, patients on diuretics, a reduced calorie diet, or lymphatic drainage, or those with mental or speech problems. | Physiotherapy & microcurrent  Comp: S-F-T  AdjMod: TENS  Set: I | 44 | 60) | NR | NR | NR |
| No data | No data | No data | Physiotherapy  Comp: S-F-T  AdjMod: -  Set: I | 45 | 57) | NR | NR | NR |
| Sattler, 2019, 30994586, Australia | NR | Moderate | INCLUSION: Patients >/=18 years of age who were scheduled to undergo uni- lateral TKR for a primary diagnosis of osteoarthritis were eligible for inclusion. EXCLUSION: Patients were excluded if they (1) preoperatively planned to be discharged to an inpatient rehabilitation/hostel facility such that the home exercise program could not be completed independently, (2) declined to participate, or (3) were scheduled for a contralateral TKR within 4 months of the initial procedure. | Pedaling-based protocol  Comp: F-T  AdjMod: -  Set: NR | 30 | 66.0 (8.7) | 40% | 29.4 (4.4) | NR |
| No data | No data | No data | Non-pedalling (multi-exercise protocol)  Comp: S-F-T  AdjMod: -  Set: - | 30 | 66.8 (6.7) | 27% | 29.3 (4.3) | NR |
| Schache, 2019, 31208916, Australia | NR | Moderate | INCLUSION: >=50 years and had undergone primary unilateral TKA for end-stage OA in the previous 2 weeks. EXCLUSION: Uncontrolled cardiovascular disease or uncontrolled diabetes; a history of ipsilateral hip replacement, ipsilateral hip OA or lateral hip pain; or neurological or any other conditions affecting strength or function of the lower limbs. | Standard rehab and hip strengthening exercises  Comp: S-A-F-B-T-E  AdjMod: massage, mobilization  Set: I, O | 54 | 70 (7) | 72% | 30 (6) | NR |
| No data | No data | No data | Standard rehab plus general functional exercise  Comp: S-A-F-B-T-E  AdjMod: massage, mobilizations  Set: I, O | 51 | 69 (7) | 58% | 31 (6) | NR |
| Shanb, 2014, CN-01041112, Saudi Arabia | NR | High | INCLUSION: 58-67 years, cemented fixed and bore non constrained prosthesis, BMI<30, moderate activity. EXCLUSION: previous knee surgery with post op complications | Active exercise training program & biofeedback  Comp: S  AdjMod: mobilization, biofeedback devices  Set: O | 50 (all participants) | 60.00 (0.89) | 38% | 25.28 (0.44) | NR |
| No data | No data | No data | Active exercise training program  Comp: S  AdjMod: mobilization  Set: O |  | 60.6 (5.08) | 30% | 26.18 (0.45) | NR |
| Stevens-Lapsley, 2012, 22095207, USA | Non-industry | Moderate | INCLUSION: 50-85 years. EXCLUSION: Uncontrolled hypertension, uncontrolled diabetes, BMI > 35 kg/m2, significant neurologic impairments, contralateral knee OA (as defined by pain > than 4/10 with activity), or other unstable lower-extremity orthopaedic conditions. | Standard rehabilitation & NMES  Comp: S-A-F-B-T-E  AdjMod: cold, NMES, massage, mobilization  Set: I, H, O | 35 | 66.2 (9.1) | 57% | 27.1 (4.9) | NR |
| No data | No data | No data | Standard rehabilitation  Comp: S-A-F-B-T-E  AdjMod: cold, massage, mobilization  Set: I, H, O | 31 | 64.8 (7.7) | 52% | 31.2 (4.2) | NR |
| Tousignant, 2011, 21398389, Canada | Non-industry | High | INCLUSION: Patients who had TKA. EXCLUSION: NR | Home telerehabilitation  Comp: E  AdjMod: -  Set: H | 21 | 66 (10) | NR | NR | NR |
| No data | No data | No data | Conventional rehabilitation  Comp: E  AdjMod: -  Set: O | 20 | 66 (13) | NR | NR | NR |
| Tsukada, 2020, 31723080, Japan | Non-industry | Moderate | INCLUSION: unilateral TKA for knee OA, female, >50 years. EXCLUSION: lower limb amputation, lower limb surgery in the last 3 months, inability to walk without a cane or walker, inflammatory joint, rheumatoid, psoriatic arthritis, polymyalgia rheumatic, multiple sclerosis, neurodegenerative disorder, known neuropathy, uncontrolled diabetes, currently being treated for cancer, terminal illness, h/o myocardial infarction, use of supplemental oxygen, implanted cardiac pacemaker | Standard rehabilitation & hybride training system  Comp: S-A-F-T-E  AdjMod: cold, NMES  Set: I | 26 | 72.8 (8.2) | - | 27.0 (4.7) | NR |
| No data | No data | No data | Standard rehabilitation  Comp: S-A-F-T-E  AdjMod: cold  Set: I | 27 | 74.1 (8.6) | - | 27.2 (4.6) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Non-industry | Moderate | INCLUSION: (i) diagnosed knee OA; (ii) primary arthroplasty of the knee in question; and (iii) age over 18 years. EXCLUSION: (i) other surgery for the lower limbs planned to be performed within 12 months; (ii) dementia; (iii) fibro- myalgia; (iv) other serious co-morbidities preventing active training; and (v) difficulty visiting a physiotherapist due to a long travelling distance. | Home exercise  Comp: S-F-E  AdjMod: -  Set: O, H | 53 | 69 (8) | 57% | 31 (5) | 28% |
| No data | No data | No data | Control  Comp: -  AdjMod: -  Set: H | 55 | 69 (9) | 65% | 31 (6) | 31% |
| Zapparoli,  2020,  32488010  Italy | Non-  Industry | High | INCLUSION: (1) age comprised between 45 and 80 years old, (2) being enrolled in the local residential rehabilitation program. EXCLUSION: (1) presence of neurologic or neurodegenerative diseases, (2) on-going psychopharmacological treatments. | Motor imagery & rehabilitation  Comp: S-F-B  AdjMod: Mindfulness  Set: AI | 24 | 66.2 (8.0) | 46% | 38.4 (6.6) | NR |
| No data | No data | No data | Rehabilitation  Comp: S-F-B  AdjMod: -  Set: AI | 24 | 66.6 (7.5) | 71% | 31.4 (6.7) | NR |

Abbreviations: AI = acute inpatient, BMI = body mass index, DVT = deep vein thrombosis, H = home, mo = month, NA = not applicable, NMES = neuromuscular electrical stimulation, NR=not reported, O = outpatient physiotherapy center, OA = osteoarthritis, PMID = PubMed identifier, RA = rheumatoid arthritis, SD = standard deviation, SD = standard deviation, TENS = transcutaneous electrical nerve stimulation, THA = total hip arthroplasty, TJA = total joint arthroplasty, TKA = total knee arthroplasty, wks = weeks, yo = years old, yr = year.

A All randomized controlled trials, except as footnoted.

B Including Components (Comp); Adjunctive modalities (AdjMod); and Setting (Set).

Components: A = aerobic exercise, B= Balance-motor/Learning-agility exercise, E = patient education, F = flexibility exercise, S = strengthening exercise, T = task-specific training.

C kg/m2

D Non-randomized controlled study

**Appendix F. Rehabilitation component details for total knee arthroplasty**

| **Study, Year, PMID, Country** | **Intended Comparison** | **Arm** | **Components (Specific Exercises/Strategies)** | **Progression (Appropriate?)** | **Personnel** | **Mode of Delivery** | **Setting** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation vs. supervised rehabilitation (usual care) [Abstract only] | Technological assisted rehabilitation | [specific goals and exercises not defined; comparison of setting and method of delivery] | 0 (NA) | Unclear | Unclear | Home |
| No data | Supervised rehabilitation | [specific goals and exercises not defined; comparison of setting and method of delivery] | 0 (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Artz, 2017, 27068368, UK | Group-based outpatient physiotherapy vs. usual care | Group-based exercise | **1. Strength**  [specific exercises not defined]  **2. Aerobic**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  **6. Patient education**  6.2 Home exercise program | 0 (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Usual care | NA  [Routine post-operative care provided by the health service including an exercise booklet and individual referral to physiotherapy if indicated] | 0 (NA) | NA | NA | NA |
| Avramidis, 2011, 21410130, Greece | Electric stimulation of the vastus medialis muscle and standard physiotherapy vs. physiotherapy only | Physiotherapy & electrical muscle stimulation | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.43 Quad sets  1.58 Straight leg raise  **3. Flexibility**  3.4 Calf stretch with knee straight (gastroc)  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.5 E-stim for strength (NMES) | Y (N) | NR | In-person | Acute Inpatient; Physical therapy/rehabilitation facility (outpatient) |
| No data | Physiotherapy | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.43 Quad sets  1.58 Straight leg raise  **3. Flexibility**  3.4 Calf stretch with knee straight (gastroc)  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  **5. Task specific training**  5.8 Gait training | Y (N) | NR | In-person | Acute Inpatient; Physical therapy/rehabilitation facility (outpatient) |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation vs. low-intensity rehabilitation | High-intensity progressive rehabilitation | **1. Strength**  1.3 Calf press (one-leg)  1.4 Calf press (two-legs)  1.5 Clamshells  1.8 Gluteal Sets  1.9 Heel raises – bilateral (calf raises)  1.11 Hip abduction in sidelying  1.12 Hip abduction in standing  1.14 Hip adduction in sidelying  1.15 Hip adduction in standing  1.19 Hip extension in standing  1.22 Hip flexion in standing  1.28 Knee extension machine (one-leg)  1.29 Knee extension machine (two-legs)  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.31 Knee extension in sitting or supine (long arc quad)  1.33 Knee flexion machine (Hamstring curl) one knee  1.34 Knee flexion machine (Hamstring curl) two knees  1.37 Knee flexion in standing  1.38 Leg Press (one leg)  1.39 Leg Press (two legs)  1.41 Lunges  1.42 Lunges to side (lateral lunge)  1.43 Quad sets  1.48 Sit-to-stand  1.49 Squats  1.52 Step down  1.54 Step lateral  1.55 Step up – forward  1.56 Step up – lateral  1.58 Straight leg raise  1.61 Wall slides  **2. Aerobic**  2.1 Aquatics (water aerobics, water walking)  2.2 Bike (Endurance)  2.3 Elliptical machine  2.7 Stepper (upright or sitting)  2.9 Walking  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.6 Heel slides  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.8 Single leg stance  4.9 Standing weight shifts  4.10 Stepping multiple directions (grapevine)  4.13 Step lateral (side step)  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  6.4 Pain management  6.6 Wound care management  **7. Adjunctive modality**  7.11 Massage for scar mobility  7.13 Mobilizations – Tibiofemoral  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Low-intensity rehabilitation | **1. Strength**  1.5 Clamshells  1.8 Gluteal Sets  1.9 Heel raises – bilateral (calf raises)  1.32 Knee extension in sitting or supine (short arc quad)  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  1.43 Quad sets  1.47 Single leg stance  1.48 Sit-to-stand  1.49 Squats  1.51 Standing terminal knee extension  1.57 Stool scoots  1.58 Straight leg raise  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.6 Heel slides  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.8 Single leg stance  4.9 Standing weight shifts  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  6.4 Pain management  6.6 Wound care management  **7. Adjunctive modality**  7.1 Cold  7.2 Heat  7.11 Massage for scar mobility  7.13 Mobilizations – Tibiofemoral  7.14 Mobilizations – Patellar | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| Bily, 2016, 26763947, Austria | Leg-press training with moderate vibration vs. functional physiotherapy | Leg-press | **1. Strength**  1.38 Leg Press (one leg) | Y (N) | Unclear | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Physiotherapy | **1. Strength**  1.11 Hip abduction in sidelying  1.12 Hip abduction in standing  1.13 Hip abduction in supine  1.31 Knee extension in sitting or supine (long arc quad)(short or long unclear)  1.32 Knee extension in sitting or supine (short arc quad) (short or long unclear)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.43 Quad sets  1.49 Squats  1.55 Step up – forward  1.58 Straight leg raise  **3. Flexibility**  3.2 Bike (ROM)  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.11 Massage for scar mobility  7.13 Mobilizations – Tibiofemoral  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill program vs. usual physiotherapy care | Walking-skill group | **1. Strength**  1.41 Lunges  1.42 Lunges to side (lateral lunge)  1.47 Single leg stance  1.48 Sit-to-stand  1.49 Squats  1.52 Step down  1.55 Step up – forward  **2. Aerobic**  2.9 Walking  **3. Flexibility**  3.3 Calf stretch with knee bent (soleus) (position unclear)  3.4 Calf stretch with knee straight (gastroc) (position unclear)  3.5 Hamstring stretch in any position  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.4 Balance with perturbations  4.8 Single leg stance  4.9 Standing weight shifts  4.11 Step down  4.13 Step lateral (side step)  4.14 Step up – forward  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.7 Gait sideways  5.8 Gait training  5.10 Gait with perturbations  5.12 Obstacle training  5.13 Sit-to-stand training  5.15 Stair training | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Usual physiotherapy care | **1. Strength**  [specific exercises not defined]  [12 physiotherapy sessions by community physiotherapists; surveys after physiotherapy indicate that most exercises targeted range of motion and strengthening and primarily occurred in sitting] | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Buhagiar , 2017, 28291891, Australia | Monitored home program vs. inpatient rehabilitation plus monitored home program | Home program | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.19 Hip extension in standing  1.32 Knee extension in sitting or supine (short arc quad)  1.37 Knee flexion in standing  1.48 Sit-to-stand  1.55 Step up – forward  1.58 Straight leg raise  1.60 Upper extremity strengthening  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.6 Heel slides  3.10 Knee extension AROM  3.14 Knee flexion PROM in sitting or supine  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.8 Single leg stance  4.15 Step up – lateral  5. Task specific training  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person; Home (monitored; access to PT); Self-guided | Home |
| No data | Hospital inpatient rehabilitation | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.15 Hip adduction in standing  1.19 Hip extension in standing  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  1.48 Sit-to-stand  1.49 Squats  1.55 Step up – forward  1.56 Step up – lateral  1.58 Straight leg raise  1.60 Upper extremity strengthening  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  2.9 Walking  **3. Flexibility**  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.6 Heel slides  3.10 Knee extension AROM  3.14 Knee flexion PROM in sitting or supine  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.8 Single leg stance  4.15 Step up – lateral  5. Task specific training  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person; Home | Acute inpatient (postoperative) |
| Cai, 2018, 29239772, China | Cognitive behavioral therapy vs. standard care | Cognitive behavioral therapy & standard care | **6. Patient education**  6.1 Activities of daily living  **7. Adjunctive modality**  7.17 Mindfulness, stress/anxiety-reduction interventions | N (NA) | Physical therapist; Other (Psychologist) | In-person | NR |
| No data | Standard care | NA  [Standard care including pain management and rehabilitative exercises] | N (NA) | NA | NA | NA |
| Chan, 2018, 29372260, SingaporeA | Discharge to home vs. discharge to community hospitals | Discharge to home | [specific goals and exercises not defined; comparison of setting] | N (NA) | Physical therapist | In-person | Home |
| No data | Discharge to community hospitals | [specific goals and exercises not defined; comparison of setting] | N (NA) | Physical therapist | In-person | Other inpatient facility |
| DeJong,  2020,  32360105  USA | Body-weight adjusted treatment vs. recumbent bike & PENS vs. Body-weight adjusted treadmill & PENS vs. Recumbent bike | Body-weight adjusted treatment | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  **5. Task specific training**  5.16 Treadmill gait  **7. Adjunctive modality**  7.1 Cold  7.13 Mobilizations – Tibiofemoral | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Recumbent bike & PENS | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.2 Bike (ROM)  **7. Adjunctive modality**  7.1 Cold  7.5 E-stim for strength (NMES)  7.13 Mobilizations – Tibiofemoral | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Body-weight adjusted treadmill & PENS | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  **5. Task specific training**  5.16 Treadmill gait  **7. Adjunctive modality**  7.1 Cold  7.5 E-stim for strength (NMES)  7.13 Mobilizations – Tibiofemoral | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Recumbent bike | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.2 Bike (ROM)  **7. Adjunctive modality**  7.1 Cold  7.13 Mobilizations – Tibiofemoral | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Demircioglu, 2015, 26355656, Turkey | Neuromuscular electrical stimulation plus standard rehabilitation (exercise) vs. standard rehabilitation (exercise) | Electrical stimulation (NMES) & exercise | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.14 Hip adduction in sidelying (position unclear)  1.15 Hip adduction in standing (position unclear)  1.16 Hip adduction in supine (position unclear)  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.43 Quad sets  1.51 Standing terminal knee extension  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.10 Knee extension AROM (extension/flexion not specified; just ROM)  3.13 Knee flexion AROM (extension/flexion not specified; just ROM)  **7. Adjunctive modality**  7.1. Cold  7.5 E-stim for strength (NMES)  7.14 Mobilizations – Patellar | 0 (NA) | Unclear | In-person for NMES | Physical therapy/rehabilitation facility (outpatient) |
| No data | Exercise | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.14 Hip adduction in sidelying (position unclear)  1.15 Hip adduction in standing (position unclear)  1.16 Hip adduction in supine (position unclear)  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.43 Quad sets  1.51 Standing terminal knee extension  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.10 Knee extension AROM (extension/flexion not specified; just ROM)  3.13 Knee flexion AROM (extension/flexion not specified; just ROM)  **6. Patient education**  6.2 Home exercise program  **7. Adjunctive modality**  7.1. Cold  7.14 Mobilizations – Patellar | N (NA) | None (unsupervised) | Self-guided (unsupervised) | Home |
| den Hertog, 2012, 22643801, Germany | Fast-track rehabilitation (“Joint Care” program) vs. standard rehabilitation | Fast-track rehabilitation program | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.14 Knee flexion PROM in sitting or supine  **5. Task specific training**  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living | N (NA) | Unclear | In-person | Acute inpatient |
| No data | Standard care | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.14 Knee flexion PROM in sitting or supine  **5. Task specific training**  5.8 Gait training  [Standard care consisted of similar exercises as the fast-track group, but different timing after surgery] | N (NA) | Unclear | In-person | Acute inpatient |
| Eymir,  2020,  32778907  Turkey | Active heel-slide exercise & standard physical therapy vs. | Active heel-slide exercise & standard physical therapy | **1. Strength**  1.8 Gluteal Sets  1.13 Hip abduction in supine  1.43 Quad sets  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.6 Heel slides  3.10 Knee extension AROM  3.13 Knee flexion AROM  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist; None (unsupervised) | In-person; self-guided | Acute inpatient; home |
| No data | Continuous passive motion & standard physical therapy | **1. Strength**  1.8 Gluteal Sets  1.13 Hip abduction in supine  1.43 Quad sets  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.10 Knee extension AROM  3.13 Knee flexion AROM  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  **7. Adjunctive modality** | Y (Y) | Physical therapist; None (unsupervised) | In-person; self-guided | Acute inpatient; home |
| Fransen, 2017, 27868384, Australia | Post-acute group exercise program vs. usual care | Outpatient group exercise | **1. Strength**  1.2 Bridges Two-legged (supine hip extension)  1.9 Heel raises – bilateral (calf raises)  1.12 Hip abduction in standing  1.19 Hip extension in standing  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.41 Lunges  1.48 Sit-to-stand  1.49 Squats  1.52 Step down  1.54 Step lateral  1.55 Step up – forward  1.56 Step up – lateral  1.61 Wall slides  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  **3. Flexibility**  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.10 Knee extension AROM  3.13 Knee flexion AROM  **5. Task specific training**  5.4 Gait backwards  5.7 Gait sideways  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Usual care | [specific goals and exercises not defined]  [Able to access acute rehabilitation management as provided by the hospital or recommended by the orthopedic surgeon; 85% received at least one face-to-face physiotherapy visit at some point post-TKA] | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| Hamilton, 2020, 33051212, UK | Progressive  outpatient physiotherapy vs. single physiotherapy review and home exercise  based intervention | Outpatient therapist-led rehabilitation | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad)  1.38 Leg Press (one leg) (unclear one or two legs)  1.39 Leg Press (two legs) (unclear one or two legs)  1.43 Quad sets  1.50 Squats (one leg)  1.55 Step up – forward  1.56 Step up – lateral  1.58 Straight leg raises  **2. Aerobic**  2.9 Walking  **3. Flexibility**  3.2 Bike (ROM)  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.11 Knee extension PROM in supine  3.13 Knee flexion AROM  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.8 Single leg stance  4.10 Stepping multiple directions (grapevine)  4.17 Tandem walking  **5. Task specific training**  5.8 Gait training  5.10 Gait with perturbations  5.13 Sit-to-stand training  **6. Patient education**  6.2 Home exercise program  6.4 Pain management | Y (Y) | Physical therapist; None (unsupervised) | In-person; Self-guided (unsupervised) | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Physiotherapy review & home exercises (standard of care) | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **6. Patient education**  6.2 Home exercise program  6.4 Pain management | N (NA) | None (unsupervised) | Self-guided (unsupervised) | Home |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation vs. land-based rehabilitation | Water-based rehabilitation | **1. Strength**  **2. Aerobic**  2.1 Aquatics (water aerobics, water walking)  **3. Flexibility**  3.10 Knee extension AROM  3.13 Knee flexion AROM  **6. Patient education**  6.2 Home exercise program | Y (N) | Physical therapist | In-person | Other (pool); Home |
| No data | Land-based rehabilitation | **3. Flexibility**  3.2 Bike (ROM)  3.10 Knee extension AROM  3.13 Knee flexion AROM  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait  **6. Patient education**  6.2 Home exercise program | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| Heikkilä, 2017, 28119232, Finland | One-year progressive postoperative home exercise program vs. usual care | Home exercise | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.10 Heel raises – unilateral  1.36 Knee flexion in sitting or supine  1.43 Quad sets  1.48 Sit-to-stand  1.49 Squats  1.54 Step lateral  1.61 Wall slides  **3. Flexibility**  3.2 Bike (ROM)  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.8 Hip flexor stretch (iliopsoas)  **4. Balance-Motor Learning-Agility**  4.9 Standing weight shifts  **6. Patient education**  6.2 Home exercise program | Y (N) | Physical therapist | In-person; Self-guided (unsupervised) - checked in at check-in visits | Home; Physical therapy/rehabilitation facility (outpatient) |
| No data | Control | [no intervention after discharge]  [Usual care consisting of the acute rehabilitation after surgery in the hospital and no additional guidance after discharge] | N (NA) | NA | NA | NA |
| Iwakiri,  2020,  32373475  Japan | Range of motion (post op day 7) vs. range of motion (post op day 7) | Range of motion (post op day 1) | **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine (position unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (position unclear)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **5. Task specific training**  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Acute inpatient |
| No data | Range of motion (post op day 7) | **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine (position unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (position unclear)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **5. Task specific training**  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Acute inpatient |
| Jin, 2018, CN-01617489, China | Virtual reality plus conventional acute rehabilitation care vs. conventional acute rehabilitation care | Virtual reality plus usual care | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.1 Ankle pumps  3.14 Knee flexion PROM in sitting or supine  **6. Patient education**  6.4 Pain management  **7. Adjunctive modality**  7.15 Biofeedback devices  7.17 Mindfulness, stress/anxiety-reduction interventions | N (NA) | Other (Research personnel) | In-person | Acute inpatient (postoperative) |
| No data | Usual care | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.1 Ankle pumps  3.14 Knee flexion PROM in sitting or supine  **6. Patient education**  6.4 Pain management  **7. Adjunctive modality**  7.17 Mindfulness, stress/anxiety-reduction interventions | N (NA) | Other (Research personnel) | In-person | Acute inpatient (postoperative) |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation program vs. conventional care | Multidisciplinary rehabilitation | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad)  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  **2. Aerobic**  2.1 Aquatics (water aerobics, water walking)  2.9 Walking  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  6.3 Life-style change  **7. Adjunctive modality**  7.17 Mindfulness, stress/anxiety-reduction interventions | Y (N) | Physical therapist | In-person; Self-guided (unsupervised) | Acute inpatient (postoperative); Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Control | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  [Conventional care: pre-operative exercise recommendations, acute exercise program for lower extremity strength and joint mobility, and supervised exercise program at 2-month visit] | Y (N) | Physical therapist | In-person; Self-guided (unsupervised) | Acute inpatient (postoperative); Physical therapy/rehabilitation facility (outpatient); Home |
| Lenguerrand, 2020, 31033232, UK | Group-based outpatient physical therapy sessions plus usual care vs. usual care | Group-based outpatient physical therapy | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad) (unclear if long or short)  1.32 Knee extension in sitting or supine (short arc quad) (unclear if long or short)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.41 Lunges  1.49 Squats  1.52 Step down  1.55 Step up – forward  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  **3. Flexibility**  3.2 Bike (ROM)  3.5 Hamstring stretch in any position  3.10 Knee extension AROM  3.13 Knee flexion AROM  3.15 Knee flexion AROM in any position (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.8 Single leg stance  4.11 Step down  4.14 Step up – forward  **5. Task specific training**  5.1. Transfers  5.6 Gait on uneven surfaces  5.7 Gait sideways  5.8 Gait training  5.12 Obstacle training  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Standard care | NA  [Usual care: Advice on knee-specific and function exercises and referral for outpatient PT as needed] | N (NA) | NA | NA | NA |
| Lenssen, 2006, 16942627, Netherlands | Two physical therapy sessions per day vs. one physical therapy session per day | Physiotherapy (twice daily; 40 mins/day)] | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.13 Sit-to-stand training  5.15 Stair training | N (NA) | Physical therapist | In-person | Acute Inpatient |
| No data | Physiotherapy (once daily; 20 mins/day)] | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.13 Sit-to-stand training  5.15 Stair training | N (NA) | Physical therapist | In-person | Acute Inpatient |
| Li, 2014, 23412304, China | Lower-limb robot assisted training system vs. traditional rehabilitation training | Robot-assisted training | **1. Strength**  1.36 Knee flexion in sitting or supine  1.43 Quad sets  **3. Flexibility**  3.1 Ankle pumps  **5. Task specific training**  5.8 Gait training (robot)  **7. Adjunctive modality**  7.5 E-stim for strength (NMES) | N (NA) | NR | In-person | Acute inpatient (postoperative) |
| No data | Traditional rehabilitation training | **1. Strength**  1.36 Knee flexion in sitting or supine  1.43 Quad sets  **3. Flexibility**  3.1 Ankle pumps  **5. Task specific training**  5.8 Gait training (assistive devices)  **7. Adjunctive modality**  7.5 E-stim for strength (NMES) | N (NA) | NR | In-person | Acute inpatient (postoperative) |
| Li, 2015, CN-01084888, China | Education for daily physical activity vs. no education [Abstract only] | Education | **6. Patient education**  [specific elements of education not defined] | Y (N) | NR | Remote via telephone | Home |
| No data | No education | NA  [No additional education] | Y (N) | NR | NR | NR |
| Li, 2017, CN-01419703, China | Early gait training vs. basic rehabilitation | Gait training & usual care | **1. Strength**  1.32 Knee extension in sitting or supine (short arc quad) (unclear long or short arc)  1.33 Knee flexion machine (Hamstring curl) one knee (unclear long or short arc)  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.9 Standing weight shifts  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.1. Cold  7.10 Massage for edema control | Y (N) | Unclear | In-person | Acute inpatient |
| No data | Usual care (including gait training but later) | **1. Strength**  1.32 Knee extension in sitting or supine (short arc quad)  1.33 Knee flexion machine (Hamstring curl) one knee  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.9 Standing weight shifts  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.1. Cold  7.10 Massage for edema control | Y (N) | Unclear | In-person | Acute inpatient |
| Li, 2019, 31003647, China | Tai chi chuan vs. Traditional physical exercises | Tai chi exercise | **1. Strength**  1.43 Quad sets  1.58 Straight leg raises  **3. Flexibility**  3.6 Heel slides  **7. Adjunctive modality**  7.18 Complementary and alternative therapies (Tai Chi) | N | Other | In-person | NR |
| No data | Control (traditional physical exercises) | **1. Strength**  1.43 Quad sets  1.58 Straight leg raises  **3. Flexibility**  3.6 Heel slides | N | NR | NR | NR |
| Liao, 2015, 25552523, Taiwan | General functional rehabilitation plus balance training vs. general functional rehabilitation alone | Functional rehabilitation & balance training | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.35 Knee flexion in prone  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  1.43 Quad sets  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  **3. Flexibility**  3.1 Ankle pumps  3.5 Hamstring stretch in any position  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.10 Stepping multiple directions (grapevine)  4.13 Step lateral (side step)  4.17 Tandem walking  **5. Task specific training**  5.4 Gait backwards  5.5 Gait downhill  5.7 Gait sideways  5.9 Gait uphill  5.10 Gait with perturbations  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Functional rehabilitation | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.35 Knee flexion in prone  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  1.43 Quad sets  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  **3. Flexibility**  3.1 Ankle pumps  3.5 Hamstring stretch in any position  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **5. Task specific training**  5.4 Gait backwards  5.5 Gait downhill  5.7 Gait sideways  5.9 Gait uphill  5.13 Sit-to-stand training  5.15 Stair training  5.16 Treadmill gait | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training vs. standard care | Elastic resistance exercise training | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.14 Hip adduction in sidelying (position unclear)  1.15 Hip adduction in standing (position unclear)  1.16 Hip adduction in supine (position unclear)  1.17 Hip extension in sidelying (position unclear)  1.18 Hip extension in prone (position unclear)  1.19 Hip extension in standing (position unclear)  1.20 Hip flexion in sidelying (position unclear)  1.21 Hip flexion in sitting (position unclear)  1.23 Hip flexion in supine (position unclear)  1.22 Hip flexion in standing (position unclear)  1.35 Knee flexion in prone  1.36 Knee flexion in sitting or supine  1.37 Knee flexion in standing  1.38 Leg Press (one leg)  1.39 Leg Press (two legs)  1.60 Upper extremity strengthening  **3. Flexibility**  [specific exercises not defined] | Y (Y) | Physical therapist | In-person; Self-guided (unsupervised) | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Standard care | NA  [Standard care consisted of knee osteoarthritis education, pharmacologic therapy, and conservative physical therapy without any resistance exercise training (active and passive range of motion, stretching, and functional conditioning), and maintenance of usually activity level] | NA | NR | In-person | NR |
| Liebs, 2010, 20360503, Germany | Ergometer cycling plus standard physiotherapy vs. standard physiotherapy alone | Ergometer cycling | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  3.2 Bike (ROM)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Control (standard daily physiotherapy) | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Liebs, 2012, 22196125, Germany | Early aquatic therapy vs. late aquatic therapy | Early Aquatic therapy | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Late Aquatic therapy (after wound healing) | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.8 Gait training  5.15 Stair training | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation vs. individual supervised home training | Group-based rehabilitation | **1. Strength**  1.6 Core strengthening  1.28 Knee extension machine (one-leg)  1.29 Knee extension machine (two-legs)  1.33 Knee flexion machine (Hamstring curl) one knee  1.34 Knee flexion machine (Hamstring curl) two knees  1.38 Leg Press (one leg)  1.39 Leg Press (two legs)  1.49 Squats  1.60 Upper extremity strengthening  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.2 Bike (ROM)  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person; None (unsupervised) | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Supervised home-exercises | **1. Strength**  [specific exercises not defined]  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **6. Patient education**  6.2 Home exercise program | N (N) | Physical therapist | In-person (planned visits); None (unsupervised) | Physical therapy/rehabilitation facility (outpatient); Home |
| Minns Lowe, 2012, 22180446, UK | Home visit physiotherapy visits vs. usual care | Home-visit physiotherapy | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.10 Heel raises – unilateral  1.47 Single leg stance  1.48 Sit-to-stand  1.49 Squats  1.55 Step up – forward  1.61 Wall slides  **3. Flexibility**  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.8 Single leg stance  4.9 Standing weight shifts  **5. Task specific training**  5.1 Transfers  5.6 Gait on uneven surfaces  5.8 Gait training  5.12 Obstacle training  5.13 Sit-to-stand training  5.15 Stair training | Y (N) | Physical therapist | In-person | Home |
| No data | Usual care | NA  [Usual care consisted of an advice booklet with gait training and exercise advice; referral to outpatient physiotherapy possible if recovery in acute was slow or if not achieving recovery targets at follow-up (less than 20% of patients)] | NA | NA | NA | NA |
| Mitchell, 2005, 15869558, UKA | Home pre-operative and post-operative physiotherapy vs. usual outpatient post-operative physiotherapy | Home rehabilitation | **3. Flexibility**  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (unclear)  3.16 Knee flexion PROM in prone (rectus femoris stretch) (unclear)  **5. Task specific training**  5.8 Gait training  6. Patient education  6.1 ADLs  6.4 Pain management  **7. Adjunctive modality**  7.12 Massage/myofascial techniques for soft tissue | N (NA) | Physical therapist | In-person | Home |
| No data | Hospital outpatient rehabilitation | **3. Flexibility**  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (unclear)  3.16 Knee flexion PROM in prone (rectus femoris stretch) (unclear)  **5. Task specific training**  5.8 Gait training  7. Adjunctive modality  7.4 E-stim for pain (TENS)  7.5 E-stim for strength (NMES) | N (NA) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Moffet, 2015, 26178888, Canada | In-home telerehabilitation vs. face-to-face home rehabilitation | In-home telerehabilitation | **1. Strength**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  6.4 Pain management | Y (Y) | Physical therapist | Remote via videoconfence | Home |
| No data | Standard home rehabilitation | **1. Strength**  [specific exercises not defined]  4. Balance-Motor Learning-Agility  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  6.4 Pain management | Y (Y) | Physical therapist | In-person | Home |
| Monticone, 2013, 23063624, Italy | Home-based functional exercises targeted at  managing kinesiophobia vs. general advice of staying active | Home-based functional exercises and kinesiophobia training | **1. Strength**  1.37 Knee flexion in standing  **3. Flexibility**  3.2 Bike (ROM)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.10 Stepping multiple directions (grapevine)  **5. Task specific training**  5.8 Gait training  5.12 Obstacle training  5.13 Sit-to-stand training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  6.4 Pain management  6.5 Self-management  **7. Adjunctive modality**  7.17 Mindfulness, stress/anxiety-reduction interventions | N (N) | Physical therapist | In-person; Remote via telephone | Other inpatient facility (rehabilitation centre); Home |
| No data | Usual care | **1. Strength**  1.37 Knee flexion in standing  **3. Flexibility**  3.2 Bike (ROM)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.10 Stepping multiple directions (grapevine)  **5. Task specific training**  5.8 Gait training  5.12 Obstacle training  5.13 Sit-to-stand training  5.15 Stair training | N (N) | Physical therapist | In-person | Other inpatient facility (rehabilitation center) |
| Moutzouri, 2018, 29473481, NR | Early self-managed focal sensorimotor training vs. functional  exercise training | Early self-managed focal sensorimotor exercise training | **1. Strength**  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.48 Sit-to-stand  1.61 Wall slides  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.6 Heel slides  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.10 Stepping multiple directions (grapevine)  4.13 Step lateral (side step)  4.17 Tandem walking  **5. Task specific training**  5.10 Gait with perturbations  5.12 Obstacle training  5.15 Stair training | Y (Y) | Physical therapist | Self-guided (unsupervised) | Home |
| No data | Functional exercise training | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.11 Hip abduction in sidelying  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.37 Knee flexion in standing  1.48 Sit-to-stand  1.58 Straight leg raises  1.61 Wall slides  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.1 Ankle pumps  3.6 Heel slides  3.10 Knee extension AROM (unclear)  3.11 Knee extension PROM in supine (unclear)  3.12 Knee extension PROM in prone (unclear)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  **5. Task specific training**  5.15 Stair training | Y (Y) | Physical therapist | Self-guided (unsupervised) | Home |
| Naylor, 2017, 28899328, Australia | Discharge to inpatient rehabilitation vs. discharge to home (observational) | Inpatient rehabilitation | [specific goals and exercises not defined; comparison of setting] | NR | NR | NR | Other inpatient facility (not acute) |
| No data | No inpatient rehabilitation | [specific goals and exercises not defined; comparison of setting] | NR | NR | NR | NR (other than not inpatient) |
| Padgett, 2018a, 29352683, USA | Discharge to home vs. discharge to inpatient rehabilitation  Discharge to skilled nursing facility vs. discharge to inpatient rehabilitation | Home | [specific goals and exercises not defined; comparison of setting] | NR | NR | NR | Home |
| No data | Long term care facility | [specific goals and exercises not defined; comparison of setting] | NR | NR | NR | Other inpatient facility (long term care facility) |
| No data | Inpatient rehabilitation | [specific goals and exercises not defined; comparison of setting] | NR | NR | NR | Other inpatient facility (inpatient rehabilitation; not acute) |
| Petersen, 2018, 29294078, Netherlands | Acupuncture and exercise vs. exercise alone | Exercise & acupuncture | **1. Strength**  [specific exercises not defined]  **2. Aerobic**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  **7. Adjunctive modality**  7.16 Dry needling (acupuncture) | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Exercise | **1. Strength**  [specific exercises not defined]  **2. Aerobic**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined] | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Petterson, 2009, 19177542, USA | Neuromuscular electrical stimulation plus progressive volitional strength training program vs. progressive volitional strength training program alone | Exercise & NMES | **1. Strength**  1.11 Hip abduction in sidelying  1.31 Knee extension in sitting or supine (long arc quad)  1.37 Knee flexion in standing  1.41 Lunges  1.43 Quad sets  1.51 Standing terminal knee extension  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.61 Wall slides  **3. Flexibility**  3.2 Bike (ROM)  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.14 Knee flexion PROM in sitting or supine  **5. Task specific training**  5.8 Gait training  5.15 Stair training  **7. Adjunctive modality**  7.5 E-stim for strength (NMES)  7.11 Massage for scar mobility  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Exercise | **1. Strength**  1.11 Hip abduction in sidelying  1.31 Knee extension in sitting or supine (long arc quad)  1.37 Knee flexion in standing  1.41 Lunges  1.43 Quad sets  1.51 Standing terminal knee extension  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.61 Wall slides  **3. Flexibility**  3.2 Bike (ROM)  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.14 Knee flexion PROM in sitting or supine  **5. Task specific training**  5.8 Gait training  5.15 Stair training  **7. Adjunctive modality**  7.11 Massage for scar mobility  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Piqueras, 2013, 23474735, Spain | Interactive virtual telerehabilitation system vs. conventional outpatient physical therapy | Interactive virtual telerehabilitation system | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  5.8 Gait training  **6. Patient education**  6.1 Activities of daily living | Y (N) | Physical therapist | In-person; Remote via app or telephone | Acute inpatient (postoperative); Home |
| No data | Conventional outpatient physical therapy | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined]  5.8 Gait training  **6. Patient education**  6.1 Activities of daily living | N (NA) | Physical therapist | In-person | Acute inpatient (postoperative); Physical therapy/rehabilitation facility (outpatient) |
| Piva, 2017, 28217891, USA | Comprehensive  Behavioral intervention (CBI) that combines intense exercises with an education program to promote health and physical activity vs. standard of care exercise program | Comprehensive behavioral intervention | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.17 Hip extension in sidelying (position unclear)  1.18 Hip extension in prone (position unclear)  1.19 Hip extension in standing (position unclear)  1.28 Knee extension machine (one-leg) (one or two legs unclear)  1.29 Knee extension machine (two-legs) (one or two legs unclear)  1.33 Knee flexion machine (Hamstring curl) one knee (one or two legs unclear)  1.34 Knee flexion machine (Hamstring curl) two knees (one or two legs unclear)  1.48 Sit-to-stand  1.49 Squats  1.50 Squats (one leg)  **2. Aerobic**  2.8 Treadmill walking  **3. Flexibility**  3.2 Bike (ROM)  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.10 Knee extension AROM  3.13 Knee flexion AROM  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  4.3 Balance on unstable surface  4.6 Marching  4.10 Stepping multiple directions (grapevine)  4.13 Step lateral (side step)  4.17 Tandem walking  **5. Task specific training**  5.4 Gait backwards  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  6.3 Life-style change | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Standard care exercise | **1. Strength**  1.11 Hip abduction in sidelying (position unclear)  1.12 Hip abduction in standing (position unclear)  1.13 Hip abduction in supine (position unclear)  1.17 Hip extension in sidelying (position unclear)  1.18 Hip extension in prone (position unclear)  1.19 Hip extension in standing (position unclear)  1.28 Knee extension machine (one-leg) (one or two legs unclear)  1.29 Knee extension machine (two-legs) (one or two legs unclear)  1.33 Knee flexion machine (Hamstring curl) one knee (one or two legs unclear)  1.34 Knee flexion machine (Hamstring curl) two knees (one or two legs unclear)  **2. Aerobic**  2.8 Treadmill walking  **3. Flexibility**  3.2 Bike (ROM)  3.3 Calf stretch with knee bent (soleus)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.10 Knee extension AROM  3.13 Knee flexion AROM  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient); Home |
| Piva, 2019, 30794296, USA | Community-based group exercise vs. clinic-based individual physical therapy vs. usual medical care | Community-based group exercise | **1. Strength**  [specific exercises not defined]  **2. Aerobic**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  [specific exercises not defined] | N (NA) | Other (athletic trainer) | In-person | Gym or other community center |
| No data | Clinic-based individual physical therapy exercise | **1. Strength**  1.17 Hip extension in sidelying (position unclear)  1.18 Hip extension in prone (position unclear)  1.19 Hip extension in standing (position unclear)  1.20 Hip flexion in sidelying (position unclear)  1.21 Hip flexion in sitting (position unclear)  1.22 Hip flexion in standing (position unclear)  1.23 Hip flexion in supine (position unclear)  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad) (position unclear)  1.31 Knee extension in sitting or supine (long arc quad) (position unclear)  1.32 Knee extension in sitting or supine (short arc quad) (position unclear)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.49 Squats  **2. Aerobic**  2.2 Bike (Endurance)  2.8 Treadmill walking  **4. Balance-Motor Learning-Agility**  [specific exercises not defined]  **5. Task specific training**  5.8 Gait training  5.13 Sit-to-stand training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program | Y (Y) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Standard care | NA  [Usual medical care with no interference from the study; waitlist for intervention after data collection] | NA | NA | NA | NA |
| Pua, 2017, 27810379, SingaporeA | Rehabilitation attendance of 2 or more sessions vs. 1 session vs. 0 sessions | Rehabilitation attendance (2 or more sessions) | **1. Strength**  1.28 Knee extension machine (one-leg)  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.38 Leg Press (one leg)  1.43 Quad sets  1.48 Sit-to-stand  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.62 Wall slides - Lateral (hip AB and ADductors)  **2. Aerobic**  2.7 Stepper (upright or sitting)  **3. Flexibility**  3.2 Bike (ROM)  3.5 Hamstring stretch in any position  3.11 Knee extension PROM in supine (seated)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.8 Single leg stance  4.13 Step lateral (side step)  4.16 Tandem standing  **5. Task specific training**  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  6.4 Pain management  **7. Adjunctive modality**  7.1. Cold  7.5 E-stim for strength (NMES) | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Rehabilitation attendance (1 session) | **1. Strength**  1.28 Knee extension machine (one-leg)  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.38 Leg Press (one leg)  1.43 Quad sets  1.48 Sit-to-stand  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.62 Wall slides - Lateral (hip abductors and adductors)  **2. Aerobic**  2.7 Stepper (upright or sitting)  **3. Flexibility**  3.2 Bike (ROM)  3.5 Hamstring stretch in any position  3.11 Knee extension PROM in supine (seated)  3.13 Knee flexion AROM (unclear)  3.14 Knee flexion PROM in sitting or supine (unclear)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.8 Single leg stance  4.13 Step lateral (side step)  4.16 Tandem standing  **5. Task specific training**  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.2 Home exercise program  6.4 Pain management  **7. Adjunctive modality**  7.1. Cold  7.5 E-stim for strength (NMES) | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Rehabilitation attendance: none | NA | NA | NA | NA | NA |
| Rockstroh, 2010, 20533147, Germany | Microcurrent therapy plus conventional postoperative physiotherapy vs. sham plus conventional postoperative physiotherapy | Physiotherapy & microcurrent | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.4 E-stim for pain (TENS) | N (NA) | Unclear | In-person | Acute Inpatient |
| No data | Physiotherapy | **1. Strength**  [specific exercises not defined]  **3. Flexibility**  [specific exercises not defined]  **5. Task specific training**  5.8 Gait training | N (NA) | Unclear | In-person | Acute Inpatient |
| Sattler, 2019, 30994586, Australia | Pedaling-based exercise protocol vs. non-pedaling (multi-exercise) protocol | Pedaling-based protocol | **3. Flexibility**  3.2 Bike (ROM)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  **5. Task specific training**  5.8 Gait training | N (NA) | Physical therapist | In-person | Acute Inpatient |
| No data | Non-pedaling (multi-exercise] protocol | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.32 Knee extension in sitting or supine (short arc quad)  1.36 Knee flexion in sitting or supine  1.43 Quad sets  1.49 Squats  1.58 Straight leg raises  **3. Flexibility**  3.1 Ankle pumps  3.4 Calf stretch with knee straight (gastroc)  3.6 Heel slides  3.10 Knee extension AROM  3.13 Knee flexion AROM  **5. Task specific training**  5.8 Gait training | N (NA) | Physical therapist | In-person | Acute Inpatient |
| Schache, 2019, 31208916, Australia | Standard rehabilitation plus hip abductor strengthening vs. standard rehabilitation plus general functional exercise | Standard rehabilitation and hip strengthening exercises | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.11 Hip abduction in sidelying  1.12 Hip abduction in standing  1.18 Hip extension in prone  1.24 Hip hikes in standing  1.35 Knee flexion in prone  1.37 Knee flexion in standing  1.39 Leg Press (two legs)  1.43 Quad sets  1.49 Squats  1.52 Step down  1.54 Step lateral  1.55 Step up – forward  **2. Aerobic**  2.2 Bike (Endurance)  **3. Flexibility**  3.4 Calf stretch with knee straight (gastroc)  3.7 Hip extensor stretch (knee to chest)  3.11 Knee extension PROM in supine (sitting)  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM (active or passive unclear)  3.14 Knee flexion PROM in sitting or supine (active or passive unclear)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.11 Step down  4.14 Step up – forward  **5. Task specific training**  5.7 Gait sideways  5.8 Gait training  5.13 Sit-to-stand training  **6. Patient education**  6.2 Home exercise program  **7. Adjunctive modality**  7.10 Massage for edema control (goal unclear)  7.11 Massage for scar mobility (goal unclear)  7.12 Massage/myofascial techniques for soft tissue (goal unclear)  7.13 Mobilizations – Tibiofemoral (joint unclear)  7.14 Mobilizations – Patellar (joint unclear) | Y (Y) | Physical therapist | In-person | Acute inpatient (postoperative) (12 days); Physical therapy/rehabilitation facility (outpatient) (6 wks) |
| No data | Standard rehabilitation plus general functional exercise | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.35 Knee flexion in prone  1.37 Knee flexion in standing  1.39 Leg Press (two legs)  1.43 Quad sets  1.49 Squats  1.52 Step down  1.55 Step up – forward  **2. Aerobic**  2.2 Bike (Endurance)  **3. Flexibility**  3.4 Calf stretch with knee straight (gastroc)  3.7 Hip extensor stretch (knee to chest)  3.11 Knee extension PROM in supine (sitting)  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM (active or passive unclear)  3.14 Knee flexion PROM in sitting or supine (active or passive unclear)  **4. Balance-Motor Learning-Agility**  4.6 Marching  4.11 Step down  4.14 Step up – forward  **5. Task specific training**  5.8 Gait training  5.13 Sit-to-stand training  **6. Patient education**  6.2 Home exercise program  **7. Adjunctive modality**  7.10 Massage for edema control (goal unclear)  7.11 Massage for scar mobility (goal unclear)  7.12 Massage/myofascial techniques for soft tissue (goal unclear)  7.13 Mobilizations – Tibiofemoral (joint unclear)  7.14 Mobilizations – Patellar (joint unclear) | Y (Y) | Physical therapist | In-person | Acute inpatient (postoperative) (12 days); Physical therapy/rehabilitation facility (outpatient) (6 wks) |
| Shanb, 2014, CN-01041112, Saudi Arabia | Active exercise training program plus biofeedback vs. active exercise training program | Active exercise training program & biofeedback | **1. Strength**  1.11 Hip abduction in sidelying  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.51 Standing terminal knee extension  1.58 Straight leg raises  1.63 Open chain ankle dorsiflexion/plantar flexion/inversion/eversion  **7. Adjunctive modality**  7.14 Mobilizations – Patellar  7.15 Biofeedback devices | Y (Y) | NR | In-person | Physical therapy/rehabilitation facility (outpatient) |
| No data | Active exercise training program | **1. Strength**  1.11 Hip abduction in sidelying  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.31 Knee extension in sitting or supine (long arc quad) (long or short unclear)  1.32 Knee extension in sitting or supine (short arc quad) (long or short unclear)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.51 Standing terminal knee extension  1.58 Straight leg raises  1.63 Open chain ankle dorsiflexion/plantar flexion/inversion/eversion  **7. Adjunctive modality**  7.14 Mobilizations – Patellar | Y (Y) | NR | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Stevens-Lapsley, 2012, 22095207, USA | Early neuromuscular electrical stimulation plus standard rehabilitation vs. standard rehabilitation | Standard rehabilitation & NMES | **1. Strength**  1.8 Gluteal Sets  1.11 Hip abduction in sidelying  1.13 Hip abduction in supine  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.37 Knee flexion in standing  1.43 Quad sets  1.49 Squats  1.51 Standing terminal knee extension  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.61 Wall slides  **2. Aerobic**  2.2 Bike (Endurance)  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.6 Heel slides  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.17 Standing terminal knee extension  **4. Balance-Motor Learning-Agility**  4.8 Single leg stance  4.11 Step down  4.14 Step up – forward  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.13 Sit-to-stand training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  **7. Adjunctive modality**  7.1. Cold  7.5 E-stim for strength (NMES)  7.11 Massage for scar mobility  7.13 Mobilizations – Tibiofemoral  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person; Home | Acute Inpatient; Home; Physical therapy/rehabilitation facility (outpatient) |
| No data | Standard rehabilitation | **1. Strength**  1.8 Gluteal Sets  1.11 Hip abduction in sidelying  1.13 Hip abduction in supine  1.30 Knee extension AAROM in sitting or supine (short- or long arc quad)  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.37 Knee flexion in standing  1.43 Quad sets  1.49 Squats  1.51 Standing terminal knee extension  1.52 Step down  1.55 Step up – forward  1.58 Straight leg raises  1.61 Wall slides  **2. Aerobic**  2.2 Bike (Endurance)  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.6 Heel slides  3.10 Knee extension AROM  3.11 Knee extension PROM in supine (position unclear)  3.12 Knee extension PROM in prone (position unclear)  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.17 Standing terminal knee extension  **4. Balance-Motor Learning-Agility**  4.8 Single leg stance  4.11 Step down  4.14 Step up – forward  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.13 Sit-to-stand training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  6.2 Home exercise program  **7. Adjunctive modality**  7.1. Cold  7.11 Massage for scar mobility  7.13 Mobilizations – Tibiofemoral  7.14 Mobilizations – Patellar | Y (Y) | Physical therapist | In-person; Home | Acute Inpatient; Home; Physical therapy/rehabilitation facility (outpatient) |
| Tousignant, 2011, 21398389, Canada | Home telerehabilitation vs. conventional rehabilitation | Telerehabilitation | [specific goals and exercises not defined beyond improving function and activities of daily living; comparison of setting & mode of delivery]  **6. Patient education**  6.1 Activities of daily living | Y (N) | Physical therapist | Remote via web | Home |
| No data | Conventional rehabilitation (Home care/outpatient clinic) | [specific goals and exercises not defined beyond improving function and activities of daily living; comparison of setting and mode of delivery]  **6. Patient education**  6.1 Activities of daily living | Y (N) | Physical therapist | In-person | Physical therapy/rehabilitation facility (outpatient) |
| Tsukada, 2020, 31723080, Japan | Conventional rehabilitation plus a hybrid training system vs. conventional rehabilitation alone | Standard rehabilitation & hybrid training system | **1. Strength**  1.8 Gluteal Sets  1.13 Hip abduction in supine  1.31 Knee extension in sitting or supine (long arc quad)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.43 Quad sets  1.58 Straight leg raises  1.63 Open chain ankle dorsiflexion/plantar flexion/inversion/eversion  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.6 Heel slides  3.10 Knee extension AROM (active assisted)  3.11 Knee extension PROM in supine (active assisted)  3.12 Knee extension PROM in prone (active assisted)  3.13 Knee flexion AROM (active assisted)  3.14 Knee flexion PROM in sitting or supine (active assisted)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (active assisted)  3.16 Knee flexion PROM in prone (rectus femoris stretch) (active assisted)  3.17 Standing terminal knee extension  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  **7. Adjunctive modality**  7.1 Cold  7.5 E-stim for strength (NMES) | Y (N) | Physical therapist | In-person | Acute inpatient |
| No data | Standard rehabilitation | **1. Strength**  1.8 Gluteal Sets  1.13 Hip abduction in supine  1.31 Knee extension in sitting or supine (long arc quad)  1.35 Knee flexion in prone (position unclear)  1.36 Knee flexion in sitting or supine (position unclear)  1.37 Knee flexion in standing (position unclear)  1.43 Quad sets  1.58 Straight leg raises  1.63 Open chain ankle dorsiflexion/plantar flexion/inversion/eversion  **2. Aerobic**  2.2 Bike (Endurance)  2.9 Walking  **3. Flexibility**  3.1 Ankle pumps  3.2 Bike (ROM)  3.6 Heel slides  3.10 Knee extension AROM (active assisted)  3.11 Knee extension PROM in supine (active assisted)  3.12 Knee extension PROM in prone (active assisted)  3.13 Knee flexion AROM (active assisted)  3.14 Knee flexion PROM in sitting or supine (active assisted)  3.15 Knee flexion AROM in any position (rectus femoris stretch) (active assisted)  3.16 Knee flexion PROM in prone (rectus femoris stretch) (active assisted)  3.17 Standing terminal knee extension  **5. Task specific training**  5.1 Transfers  5.8 Gait training  5.15 Stair training  **6. Patient education**  6.1 Activities of daily living  **7. Adjunctive modality**  7.1 Cold | Y (N) | Physical therapist | In-person | Acute inpatient |
| Vuorenmaa, 2014, 24241606, Finland | Monitored home exercise program vs. normal care | Home exercise | **1. Strength**  1.9 Heel raises – bilateral (calf raises)  1.10 Heel raises – unilateral  1.31 Knee extension in sitting or supine (long arc quad)  1.32 Knee extension in sitting or supine (short arc quad)  1.36 Knee flexion in sitting or supine  1.48 Sit-to-stand  1.49 Squats  1.55 Step up – forward  1.61 Wall slides  **3. Flexibility**  3.2 Bike (ROM)  3.4 Calf stretch with knee straight (gastroc)  3.5 Hamstring stretch in any position  3.8 Hip flexor stretch (iliopsoas)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **6. Patient education**  6.2 Home exercise program | Y (N) | Physical therapist | In-person; Home | Physical therapy/rehabilitation facility (outpatient); Home |
| No data | Control | [Normal care consisted of no additional guidance after baseline measures] | N (NA) | None | NA | Home |
| Zapparoli,  2020,  32488010  Italy | Motor imagery & rehabilitation vs. rehabilitation | Motor imagery & rehabilitation | **1. Strength**  **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  **5. Task specific training**  5.8 Gait training  **7. Adjunctive modality**  7.17 Mindfulness, stress/anxiety-reduction interventions | N (NA) | Physical therapist | In-person | Acute inpatient |
| No data | Rehabilitation | **1. Strength**  **3. Flexibility**  3.10 Knee extension AROM  3.11 Knee extension PROM in supine  3.12 Knee extension PROM in prone  3.13 Knee flexion AROM  3.14 Knee flexion PROM in sitting or supine  3.15 Knee flexion AROM in any position (rectus femoris stretch)  3.16 Knee flexion PROM in prone (rectus femoris stretch)  **4. Balance-Motor Learning-Agility**  **5. Task specific training**  5.8 Gait training | N (NA) | Physical therapist | In-person | Acute inpatient |

Abbreviations: AAROM = assisted active range of motion, ADL = activities of daily living, AROM = active range of motion, NA = not applicable, NMES = neuromuscular electrical stimulation, NR = not reported, PROM = passive range of motion, ROM = range of motion, TENS = transcutaneous electrical nerve stimulation, TKA = total knee arthroplasty.

A Non-randomized study

Appendix G. Risk of bias assessment for randomized controlled trials evaluating rehabilitation for total knee arthroplasty

| **Study, Year, PMID** | **Random** | **Allocation** | **Blinding, Participants** | **Blinding, Providers** | **Blinding, Outcome, Obj / Subj** | **Dropout** | **Reporting Bias** | **Other** | **Population** | **Intervention** | **Outcomes** | **Overall RoB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, No PMID | Unsure | Unsure | High | High | Low | Unsure | Low | Low | No | No | No | High |
| Artz, 2017, 27068368 | Low | Low | High | High | Unsure | High | Low | Low | No | No | No | High |
| Avramidis, 2011, 21410130 | Low | Low | High | High | Low | Low | Unsure | Low | No | No | No | Moderate |
| Bade, 2017, 27813347 | Low | Low | Low | High | Low | Low | Unsure | Low | No | No | No | Moderate |
| Bily, 2016, 26763947 | Unsure | Low | High | High | High | Low | Low | Low | No | No | No | High |
| Bruun-Olsen, 2013, 23614370 | Low | Low | High | Low | Low | Low | Low | Low | No | No | No | Moderate |
| Buhagiar, 2017, 28291891 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Cai, 2018, 29239772 | Low | Low | High | Low | Low | Low | Low | Low | No | No | No | Moderate |
| DeJong, 2020,  32360105 | Low | Unsure | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Demircioglu, 2015, 26355656 | High | Unsure | Unsure | Unsure | Unsure | Low | Low | Low | No | No | No | High |
| den, 2012, 22643801 | Low | Low | High | High | Unsure | Low | Low | Low | No | No | No | Moderate |
| Eymir, 2020,  32778907 | Low | High | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Fransen, 2017, 27868384 | Low | Low | High | Low | High | Low | Low | Low | No | No | No | Moderate |
| Hamilton, 2020, 33051212 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Harmer, 2009, 19177536 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Heikkilä, 2017, 28119232 | Low | Unsure | High | High | High | Low | Unsure | Low | No | No | Unsure | High |
| Iwakiri, 2020,  32373475 | Low | Unsure | High | High | Low | Low | Low | Low | No | No | No | High |
| Jin, 2018, CN-01617489 | Low | Unsure | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Kauppila, 2010, 20354057 | Low | Low | High | High | High | Low | Low | Unsure | No | No | No | Moderate |
| Lenguerrand, 2020, 31033232 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Lenssen, 2006, 16942627 | Low | Low | High | Unsure | Low | Low | Low | Low | No | No | No | Moderate |
| Li, 2014, 23412304 | Unsure | Unsure | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Li, 2015, CN-01084888 | Unsure | Unsure | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Li, 2019, 31003647 | Low | Low | High | High | Unsure | Low | Low | Low | No | No | No | Moderate |
| Li, 2017, No PMID | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Liao, 2015, 25552523 | Low | Unsure | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Liao, 2020, 31687984 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Liebs, 2010, 20360503 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Liebs, 2012, 22196125 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Madsen, 2013, 23651717 | Unsure | Low | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Minns Lowe, 2012, 22180446 | Low | Low | High | High | Low | Low | Low | High | No | No | No | High |
| Mitchell, 2005, 15869558 | Low | High | High | High | Unsure | Low | Low | Low | No | No | No | High |
| Moffet, 2015, 26178888 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Monticone, 2013, 23063624 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Moutzouri, 2018, 29473481 | Low | Low | High | High | Unsure | Low | Low | Low | No | No | No | Moderate |
| Petersen, 2018, 29294078 | Low | Low | Unsure | Low | Low | Low | Low | Low | No | No | No | Moderate |
| Petterson, 2009, 19177542 | Unsure | Unsure | High | High | Low | High | Low | Low | No | No | No | High |
| Piqueras, 2013, 23474735 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Piva, 2017, 28217891 | Low | Low | Low | High | Low | Low | Low | Low | No | No | No | Moderate |
| Piva, 2019, 30794296 | Low | Low | High | Low | Low | Low | Low | Low | No | No | No | Moderate |
| Rockstroh, 2010, 20533147 | Low | Unsure | High | Unsure | High | Low | Unsure | Low | No | No | No | High |
| Sattler, 2019, 30994586 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Schache, 2019, 31208916 | Low | Low | High | Low | Low | Low | Low | Low | No | No | No | Moderate |
| Shanb, 2014, No PMID | High | High | High | Low | High | Low | Low | Low | Yes | Yes | Yes | High |
| Stevens-Lapsley, 2012, 22095207 | Low | Low | High | High | High | Low | Low | Low | No | No | No | Moderate |
| Tousignant, 2011, 21398389 | Low | Low | High | High | Unsure | Low | High | Low | Unsure | No | No | Moderate |
| Tsukada, 2020, 31723080 | Low | Low | High | High | Unsure | Low | Low | Low | No | No | No | Moderate |
| Vuorenmaa, 2014, 24241606 | Low | Low | High | High | Low | Low | Low | Low | No | No | No | Moderate |
| Zapparoli, 2020,  32488010 | Low | Unsure | High | High | Low | Low | Low | Low | No | No | No | High |

PMID = Obj = objective, PubMed Identifier, Subj = subjective.

From the Cochrane Risk of Bias Tool (each item rated as Low, High, Unsure, or N/A). Ratings are color coded for emphasis only.

* Random: Random sequence generation (selection bias): Selection bias (biased allocation to interventions) due to inadequate generation of a randomized sequence;
* Allocation: Allocation concealment (selection bias): Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment;
* Blinding of participants (performance bias): Performance bias due to knowledge of the allocated interventions by participants during the study;
* Blinding of personnel/care providers (performance bias): Performance bias due to knowledge of the allocated interventions by personnel/care providers during the study;
* Blinding of outcome assessor (detection bias): Detection bias due to knowledge of the allocated interventions by outcome assessors;
* Dropout: Incomplete outcome data (attrition bias): Attrition bias due to amount, nature or handling of incomplete outcome data;
* Reporting Bias: Selective outcome reporting (outcome reporting bias): Bias arising from outcomes being selectively reported based on the direction and/or strength of the results;
* Other Bias: Bias due to problems not covered elsewhere in the table.

From the National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tool (each item rated as No, Yes, or Unsure)

* Population: Eligibility criteria prespecified and clearly described: potentially related to selection bias;
* Intervention: Intervention clearly described and delivered consistently: potentially related to performance bias;
* Outcomes: Outcomes prespecified, clearly defined, valid, reliable, and assessed consistently: potentially related to detection bias.

Overall risk of bias assessed as **HIGH**, **MODERATE**, or **LOW.**

Appendix H. Risk of bias assessment for – nonrandomized comparative studies (NRCSs) evaluating rehabilitation for total knee arthroplasty

| **Study, Year, PMID** | **1.1 Potential for any confounding?** | **1.2 Potential for time-varying confounding?** | **1.3 Intervention Switches Related to ProgLowstic Factors?** | **1.4 Appropriate analysis method for confounding?** | **1.5 Appropriate confounding variables used?** | **1.6 Inappropriate control of post-intervention variables?** | **Judgement – Risk of bias related to confounding** | **2.1 Participant selection based on post-intervention variables?** | **2.2 Post-intervention variables associated with intervention?** | **2.3 Post-intervention variables associated with outcome?** | **2.5 Appropriate adjustment for selection bias** | **Judgement – Risk of bias related to selection bias** | **Overall RoB** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Chan, 2018, 29372260 | Yes | No | No | Yes | Yes | No | Low | No | N/A | N/A | N/A | Low | Moderate |
| Naylor, 2017, 28899328 | Yes | No | No | Yes | Yes | No | Low | No | N/A | N/A | N/A | Low | Moderate |
| Padgett, 2018, 29352683 | Yes | No | No | Yes | Yes | No | Low | No | N/A | N/A | N/A | Low | Moderate |
| Pua, 2017, 27810379 | Yes | No | No | Yes | Yes | No | Low | No | N/A | N/A | N/A | Low | Moderate |

* PMID = PubMed Identifier, Responses to Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) signaling questions 1.1 to 1.6 and 2.1 to 2.5 are in regular font. Each item rated as High, PY (probably High), NI (Low information), PN (probably Low), Low, or N/A (Not applicable).
* Judgments about confounding and selection bias are in **bold font** and each item is rated as Low, **Moderate**, **Serious**, or **Critical**. Ratings are color coded for emphasis only.

**Appendix I. Outcome data**

Body Structure and Function Outcomes – Acute rehabilitation for Total Knee Arthroplasty

**Symptoms**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | WOMAC: Stiffness (0-8) | 6 mo | 53 | 0.97 (NR) | 49 | 0.86 (NR) | NR | NR |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily (40 min/day)] | Physiotherapy [once daily (20 min/day)] | Moderate | WOMAC: Stiffness (0-8) | 3 mo | 21 | 6.1 (1.2) | 22 | 6.5 (1.1) | -0.4 (-1.04, 0.32) | NR |
| Liebs, 2010, 20360503 | Ergometer cycling | Control | Moderate | WOMAC: Stiffness (0-100) | 24 mo | 52 | 23 (22.8) | 66 | 17.4 (17.3) | NR | 0.235 |
| Liebs, 2012, 22196125 | Early Aquatic therapy | Late Aquatic therapy | Moderate | WOMAC: Stiffness (0-100) | 24 mo | 66 | 15.2 (14.1) | 69 | 20.4 (21.7) | 0.28 (NR) | 0.347 |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj = adjusted, CI = confidence interval, MD = mean difference, mo = month, min = minutes, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

**Pain**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | EQ-5D (VAS) (0-100) | 6.5 mo | 79 | 78.8 (95 % CI 75.3 , 82.3) | 80 | 80.2 (95 % CI 76.7 , 83.8) | −1.41 (−6.42, 3.60) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | EQ-5D (VAS) (0-100) | 12 mo | 79 | 76.9 (95 % CI 73.4 , 80.4) | 77 | 77.4 (95 % CI 73.8 , 81) | −0.50 (−5.53, 4.52) | NR |
| Eymir, 2020,  32778907  Turkey | Standard Physiotherapy plus Active heel-slide exercise (AHSE) | Physiotherapy plus CPM | High | VAS (0-10): Activity | 3 mo | 55 | 1.5 (2.3) | 58 | 1.0 (1.9) | 0.6 (0.8, 3.0) | NS |
| Standard Physiotherapy plus Active heel-slide exercise (AHSE) | Physiotherapy plus CPM | High | VAS (0-10): Rest | 3 mo | 55 | 0.8 (1.5) | 58 | 1.0 (2.0) | 1.9 (1.4, 2.4) | NS |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | WOMAC: Pain (0-20) | 6 mo | 53 | 1.69 (NR) | 49 | 1.89 (NR) | NR | NR |
| Water-based rehabilitation | Land-based rehabilitation | Moderate | VAS (0-10) | 6 mo | 53 | 0.76 (NR) | 49 | 0.67 (NR) | 0.5 (0.2, 1.1) | NR |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | WOMAC: Pain (0-20) | 3 mo | 21 | 15.2 (3.0) | 22 | 16.2 (2.4) | -1 (-2.7, 0.7) | NR |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | VAS (0-10): Last 24hrs | 3 mo | 21 | 1.3 (1.9) | 22 | 0.8 (1.5) | 0.5 (-0.6, 1.6) | NR |
| Li, 2017, CN-01084888, China | Gait training & usual care | Usual care | Moderate | VAS (NR) | 6 mo | 43 | 0.51 (0.74) | 43 | 2.93 (0.88) | -**2.4 (-2.7, -2.2)B** | NR |
| Liebs, 2010, 20360503,  Germany | Ergometer cycling | Control | Moderate | WOMAC: Pain (0-20) | 24 mo | 66 | 14.3 (17.7) | 52 | 11.1 (14.4) | NR | 0.278 |
| Liebs, 2012, 22196125 | Early Aquatic therapy | Late Aquatic therapy | Moderate | WOMAC: Pain (0-20) | 24 mo | 66 | 9.6 (11.9) | 69 | 15.2 (19.2) | 0.35 (NR, NR) | 0.097 |
| Piqueras, 2013, 23474735, Spain | Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | VAS (NR) | 3 mo | 68 | NR (NR) | 65 | NR (NR) | NR | 0.284 |
| Rockstroh, 2010, 20533147, Germany | Physiotherapy & microcurrent | Physiotherapy | High | VAS (NR) | 3 mo | 37 | Median (IQR) 0 (0 ,1) | 41 | Median (IQR) 2 (0 ,3) | **2.0 (1.4, 2.6)B** | **<0.001** |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise) protocol | Moderate | EQ-5D (VAS) (0-100) | 4 mo | 28 | Median (90) | 28 | Median (8.8) | NR | NR |
| Stevens Lapsley, 2012,  22095207,  USA | Standard rehabilitation & NMES | Standard rehabilitation | High | VAS (0-10): Pain while resting | 12 mo | 25 | 0.6 (1.4) | 30 | 0.4 (1.5) | 0.2 (-0.3, 0.7)B | NR |
| Tsukada, 2020, 31723080, Japan | Standard rehabilitation & hybrid training system | Standard rehabilitation | High | VAS (0-10) | 3 mo | 20 | 21 (NR) | 20 | 18 (NR) | NR | ns |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj = adjusted, CI = confidence interval, EQ-5D = EuroQol-5D, KOOS = Knee injury and osteoarthritis outcome score, MD = mean difference, mo = month, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, VAS = visual analog scale, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Calculated

**Range of motion**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar,  2017,  28291891,  Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | Knee ROM (active/passive unspecified): Flexion >100 degreesB | 6.5 mo | 80 | 66 events | 80 | 62 events | 1.29 (0.59, 2.84)C | NR |
| Eymir,  2020,  32778907  Turkey | Standard Physiotherapy plus Active heel-slide exercise | Physiotherapy plus CPM | High | Knee ROM (active/passive unspecified): Flexion (deg) | 3 mo | 55 | 110.0 (11.8) | 58 | 109.1 (13.0) | -0.9 (-4.1, 2.3) | NS |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | Passive Knee ROM: Extension (deg) | 6 mo | 53 | 0.86 (NR) | 49 | 1.71 (NR) | NR | NR |
| Water-based rehabilitation | Land-based rehabilitation | Moderate | Passive Knee ROM: Flexion (deg) | 6 mo | 53 | 104.04 (NR) | 49 | 105.18 (NR) | NR | NR |
| Iwakiri, 2020,  32373475, Japan | ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Extension (deg) | 3 mo | 55 | 1.20 (NR) | 54 | 2.45 (NR) | NR | NS |
| ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Extension (deg) | 12 mo | 55 | 0 (NR) | 54 | 0 (NR) | NR | NS |
| ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Extension (deg) | 24 mo | 55 | 0 (NR) | 54 | 0 (NR) | NR | NS |
| ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Flexion (deg) | 3 mo | 55 | 125.82 (NR) | 54 | 123.21 (NR) | NR | NS |
| ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Flexion (deg) | 12 mo | 55 | 124.41 (NR) | 54 | 119.84 (NR) | NR | NS |
| ROM day 1 | ROM day 7 | High | Knee ROM (active/passive unspecified: Flexion (deg) | 24 mo | 55 | 124.74 (NR) | 54 | 119.84 (NR) | NR | NS |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Passive knee ROM: Extension (deg) | 3 mo | 21 | 3.8 (4.3) | 22 | 5.5 (4.6) | -1.7 (-4.5, 1.03) | NR |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Passive knee ROM: Flexion (deg) | 3 mo | 21 | 36.6 (17.9) | 22 | 32.1 (18.4) | 4.5 (-6.8, 15.6) | NR |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Active knee ROM: Extension (deg) | 3 mo | 21 | 5.3 (5.1) | 22 | 8.3 (5.5) | -3 (-6, 7.03) | NR |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Active knee ROM: Flexion (deg) | 3 mo | 21 | 103.7 (13) | 22 | 105.1 (15) | -1.4 (-10.0, 7.3) | NR |
| Li, 2017, CN-01084888, China | Gait training &usual care | Usual care | Moderate | Knee ROM: Extension and flexion | 6 mo | 43 | 135.14 (7.19) | 43 | 94.84 (2.77) | **40.3 (38.4, 42.2)B** | **NR** |
| Piqueras, 2013, 23474735, Spain | Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | Active knee ROM: Extension (deg) | 3 mo | 68 | NR (NR) | 65 | NR (NR) | NR | 0.478 |
| Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | Active knee ROM: Flexion (deg) | 3 mo | 68 | NR (NR) | 65 | NR (NR) | NR | 0.193 |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise) protocol | High | Knee ROM (active/passive unspecified): Flexion (deg) | 4 mo | 28 | 113.0 ± 10.4 | 28 | 110.4 (9.1) | **2.7 (2.6 to 7.9)** | **0.310** |
| Stevens Lapsley,2012, 22095207, USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Active Knee ROM: Extension | 12 mo | 25 | -2 (3.5) | 30 | -1.4 (3.4) | -0.6 (-1.9, 0.7)C | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Active Knee ROM: Flexion | 12 mo | 25 | 119.4 (6.3) | 30 | 117 (9.1) | 2.4 (-0.5, 5.3)C | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, CI = confidence interval, CPM = continuous passive motion, deg = degree, mo = month, NMES = neuromuscular electric stimulation, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion, SD = standard deviation.

A Time from surgery

B Categorical outcome

C Calculated

**Strength**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Piqueras, 2013, 23474735, Spain | Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | Strength: Hamstring (kg) | 3 mo | 68 | NR (NR) | 65 | NR | NR | 0.349 |
| Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | Strength: Quadriceps (kg) | 3 mo | 68 | NR (NR) | 65 | NR | **NR** | **0.018** |
| Stevens Lapsley,2012, 22095207, USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Quadriceps femoris torqueB (Nm/kg) | 3 mo | 30 | 1.42 (0.52) | 29 | 1.20 (0.42) | **0.22 (-0.02, 0.46)** | **<0.05** |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Quadriceps femoris torqueB (Nm/kg) | 6 mo | 31 | 1.51 (0.48) | 27 | 1.39 (0.44) | 0.12 (-0.12, 0.36)C | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Quadriceps femoris torqueB (Nm/kg) | 12 mo | 30 | 1.66 (0.52) | 25 | 1.50 (0.43) | **0.16 (-0.09, 0.41)C** | **<0.05** |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Hamstring torque (Nm/kg) | 3 mo | 29 | 0.73 (0.21) | 30 | 0.65 (0.24) | 0.08 (-0.03, 0.19)C | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Hamstring torque (Nm/kg) | 6 mo | 31 | 0.79 (0.25) | 27 | 0.72 (0.25) | 0.07 (-0.06, 0.2)C | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Strength: Hamstring torque (Nm/kg) | 12 mo | 30 | 0.83 (0.25) | 24 | 0.72 (0.29) | **0.11 (-0.04, 0.26)C** | **<0.05** |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Quadriceps activation (%) | 3 mo | 30 | 86.5 (12.9) | 29 | 85.4 (11.5) | 1.1 (-5.13, 7.33) | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Quadriceps activation (%) | 6 mo | 31 | 88.4 (10.1) | 26 | 84.2 (10.0) | 4.2 (-1.04, 9.44)C | NR |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Quadriceps activation (%) | 12 mo | 30 | 87.6 (9.2) | 23 | 85.9 (11.9) | 1.7 (-3.87, 7.27)C | NR |
| Tsukada, 2020, 31723080, Japan | Standard rehabilitation & hybrid training system | Standard rehabilitation | Moderate | Strength: Isometric knee extension (N) | 3 mo | 20 | 184 (NR) | 20 | 155 (NR) | NR | ns |
| Standard rehabilitation & hybrid training system | Standard rehabilitation | Moderate | Strength: Isometric knee flexion (N) | 3 mo | 20 | 102 (NR) | 20 | 98 (NR) | **NR** | **<0.01** |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, N = Newton, Nm = peak torque, NR = not reported, kg = kilogram, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, SE = standard error.

A Time from surgery

B Normalized to body weight for all strength outcomes

C Calculated

**Emotional functioning**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Avramidis, 2011, 21410130, Greece | TENS plus Physiotherapy | Physiotherapy | Moderate | SF-36: Mental health (0-100) | 3 mo | 12 | 53.51 (4.2) | 19 | 49.2 (4.23) | **4.3 (2.1, 6.5)B** | **<0.001** |
| TENS plus Physiotherapy | Physiotherapy | Moderate | SF-36: Mental health (0-100) | 12 mo | 15 | 50.49 (5.32) | 21 | 50.1 (3.69) | 0.4 (2.0, 2.7)B | 0.694 |
| Stevens Lapsley, 2012, 22095207,USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | SF-36: Mental health (0-100) | 12 mo | 25 | 57.8 (4.4) | 30 | 54.8 (6.9) | 3 (0.8, 5.2)B | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SF-36 = 36-Item short form survey, SD = standard deviation, TENS = transcutaneous electrical nerve stimulation.

A Time from surgery

B Calculated

Body Structure and Function Outcomes – Post-acute rehabilitation for Total Knee Arthroplasty

**Symptoms**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Artz, 2017, 27068368,UK | Group-based exercise | Usual care | High | KOOS: Symptoms (0-100) | 3 mo | 19 | 59.6 (16.4) | 12 | 54.8 (16.9) | 4.8 (-3.9, 13.5)B | NR |
| Group-based exercise | Usual care | High | KOOS: Symptoms (0-100) | 6 mo | 21 | 58.4 (18.9) | 15 | 56.7 (14.3) | 1.7 (-6, 9.4)B | NR |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | 21 individual physiotherapy sessions | Moderate | KOOS: Symptoms (0-100) | 9 mo | 29 | 52 (18) | 28 | 73 (21) | adj 2 (-9, 13) | NR |
| DeJong,  2020,  32360105  USA | Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: Symptoms (0-100) | 6 mo | 70 | 84.3 (18.7) | 78 | 81.1 (16.2) | -3.2 (-7.2, 0.8) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: Symptoms (0-100) | 6 mo | 70 | 84.3 (18.7) | 76 | 83.3 (19.8) | -1.0 (-5.5, 3.4) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: Symptoms (0-100) | 6 mo | 70 | 84.3 (18.7) | 74 | 87.0 (12.2) | 2.7 (-1.1, 6.5) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | WOMAC: Stiffness (0-100) | 3 mo | 30 | 42.9 (12.6) | 30 | 47.9 (12.3) | **-5 (-9.5, -0.5)B** | **NR** |
| Lenguerrand, 2020, 31033232, UK | Physical therapy and standard care | Standard care | Moderate | KOOS: Symptoms (0-100) | 12 mo | 74 | 77 (17) | 64 | 77 (20) | 0 (-4.5, 45)B | 0.377 |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | KOOS: Symptoms (0-100) | 3 mo | 46 | Media (IQR) 67.9 (29) | 47 | Media (IQR) 71.4 (29) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Symptoms (0-100) | 6 mo | 42 | Media (IQR) 76.8 (21) | 44 | Media (IQR) 71.4 (29) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Symptoms (0-100) | 12 mo | 44 | Media (IQR) 82.1 (18) | 48 | Media (IQR) 78.8 (31) | NR | NR |
| Mitchell, 2005, 15869558, UK | Hospital | Home | High | WOMAC: Stiffness (0-100) | 4 mo | 57 | 3.6 (2.1) | 57 | 3.5 (1.4) | Adj MD -0.2 (-0.9, 0.4) | 0.496 |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | KOOS: Symptoms (0-100) | 4 mo | 100 | 71.9 (NR) | 98 | 74.8 (NR) | -2.6 (-7, 1.8) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | WOMAC: Stiffness (0-100) | 4 mo | 100 | 72.1 (NR) | 98 | 71 (NR) | -0.7 (-5.2, 6.5) | NR |
| Monticone, 2013, 23063624, Italy | Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Symptoms (0-100) | 6 mo | 55 | NR (NR) | 55 | NR (NR) | **13.1 (8.44, 17.76)** | **NR** |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Symptoms (0-100) | 12 mo | 55 | NR (NR) | 55 | NR (NR) | **10.59 (6.0, 15.18)** | **NR** |
| Petersen, 2018, 29294078, Netherlands | Exercise & acupuncture | Exercise | Moderate | KOOS: Symptoms (0-100) | 3 mo | 82 | N with success (%) 46 (55) | 83 | N with success (%) 50 (60) | RR 0.92 (0.71, 1.19) | 0.53 |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | KOOS: Symptoms (0-100) | 6.5 mo | 48 | 82 (13) | 48 | 79 (14) | 2 (-4, 9) | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference CI = confidence interval, KOOS = Knee injury and osteoarthritis outcome score, mo = month, NR = not reported, PENS = patterned electrical neuromuscular stimulation, PMID = PubMed identifier, RR = relative risk; RoB = risk of bias, SD = standard deviation, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Calculated

**Pain**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Artz, 2017, 27068368, UK | Group-based exercise | Usual care | High | KOOS: Pain (0-100) | 3 mo | 19 | 74.1 (19.9) | 12 | 19 (74.1) | 55.1 (16.9, 93.3)B | NR |
| Group-based exercise | Usual care | High | KOOS: Pain (0-100) | 6 mo | 21 | 78.6 (25.9) | 15 | 70.9 (27.1) | 7.7 (-4.9, 20.3)B | NR |
| Group-based exercise | Usual care | High | VAS (NR) | 3 mo | 19 | 3.5 (3.1) | 12 | 3.6 (2.2) | -0.1 (-1.4, 1.2)B | NR |
| Group-based exercise | Usual care | High | VAS (NR) | 6 mo | 21 | 2.9 (3.4) | 15 | 3.9 (3.6) | -1 (-2.7, 0.7)B | NR |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | 15 individual physiotherapy sessions | Moderate | KOOS: Pain (0-100) | 9 mo | 29 | 82 (21) | 28 | 74 (23) | Adj 0 (-9, 10) | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | VAS (0-100): During activityC | 3 mo | 26 | 2.7 (0.45) | 29 | 2.3 (0.41) | 0.4 (0.2, 0.6)B | 0.17 |
| Leg-press group | Physiotherapy group | High | VAS (0-100): At restD | 3 mo | 26 | 1.3 (0.36) | 29 | 1.1 (0.31) | 0.2 (0.1, 0.3)B | 0.51 |
| Cai, 2018, 29239772, China | Cognitive behavioral therapy & standard care | Standard care | Moderate | VAS (0-10) | 6 mo | 50 | 5.63 (0.73) | 50 | 6.27 (0.86) | NMD -0.57 (-0.9, -0.2)B | 0.080 |
| Cognitive behavioral therapy & standard care | Standard care | Moderate | Pain catastrophizing scale (0-52) | 6 mo | 50 | 23.34 (3.82) | 50 | 30.40 (4.34) | **NMD -7.7 (-9.3, -6.1)**B | **<.001** |
| DeJong,  2020,  32360105  USA | Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: Pain (0-100) | 6 mo | 70 | 86.7 (18.4) | 78 | 83.8 (18.5) | -2.9 (-7.1, 1.3) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: Pain (0-100) | 6 mo | 70 | 86.7 (18.4) | 76 | 87.6 (18.6) | 0.9 (-3.3, 5.1) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: Pain (0-100) | 6 mo | 70 | 86.7 (18.4) | 74 | 89.9 (18.6) | 3.2 (-1.0, 7.4) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | WOMAC: Pain (0-20) | 3 mo | 30 | 42.8 (16.8) | 30 | 48.5 (14.2) | **-5.7 (-11.3, -0.1)B** | NR |
| NMES & exercise | Exercise | High | VAS (0-10) | 3 mo | 30 | 8.4 (0.6) | 30 | 3.5 (0.6) | **4.9 (4.7, 5.1)B** | **NR** |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | WOMAC: Pain (0-20) | 12 mo | 179 | 2.6 (0.2) | 169 | 2.5 (0.2) | -0.1 (-0.7, 0.5) | 0.71 |
| Heikkilä, 2017, 28119232, Finland | Home exercise | Control | High | VAS (0-100)E | 2 mo | 53 | 22 (20) | 55 | 27 (22) | -5 (-10.6, 0.6)B | NR |
| Home exercise | Control | High | VAS (0-100)E | 14 mo | 50 | 12 (21) | 52 | 15 (20) | -3 (-8.6, 2.6)B | NR |
| Lenguerrand, 2020, 31033232, UK | Physical therapy and standard care | Standard care | Moderate | KOOS: Pain (0-100) | 12 mo | 66 | 83 (20) | 57 | 81 (21) | 2 (-3.2, 7.2)B | 0.111 |
| Li, 2015, CN-01084888, China | Education | No education | High | VAS (NR) | 3 mo | 25 | NR | 25 | NR | No difference | NR |
| Education | No education | High | VAS (NR) | 6 mo | 25 | NR | 25 | NR | No difference | NR |
| Li, 2019, 31003647, China | Tai chi exercise | Control | Moderate | WOMAC: Pain (0-20) | 3 mo | 54 | 9.1 (2) | 53 | 9.3 (1.9) | -0.2 (-0.7, 0.3)B | 0.07 |
| Liao, 2015, 25552523, Taiwan | Functional plus balance rehabilitation | Functional rehabilitation | High | WOMAC: Pain (0-20) | 32 w | 65 | 1.9 (1.2) | 65 | 1.6 (1.0) | 0.3 (0.03, 0.6)B | NR |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training | Standard care | Moderate | WOMAC: Pain (0-20) | 4 mo | 30 | 2.97 (1.59) | 30 | 4.48 (1.39) | **-1.5 (-2, -1)B** | **0.001** |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | KOOS: Pain (0-100) | 3 mo | 46 | Median (IQR) 69.1 (28) | 47 | Median (IQR) 72.2 (29) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Pain (0-100) | 6 mo | 42 | Median (IQR) 75 (25) | 43 | Median (IQR) 75 (31) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Pain (0-100) | 12 mo | 44 | Median (IQR) 80.6 (36) | 48 | Median (IQR) 90.3 (33) | NR | NR |
| Mitchell, 2005, 15869558, UK | Hospital | Home | High | SF-36: Bodily pain (0-100) | 4 mo | 57 | 48.5 (26.8) | 57 | 46.6 (20.6) | Adj MD -3.4 (-12.0, 5.2) | 0.432 |
| Hospital | Home | High | WOMAC: Pain (0-20) | 4 mo | 57 | 6.9 (4.3) | 57 | 6.8 (3.7) | Adj MD -0.5 (-2.0, 1.0) | 0.53 |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | KOOS: Pain (0-100) | 4 mo | 100 | 78.1 (NR) | 98 | 80.1 (NR) | -1.8 (-6.2, 2.5) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | WOMAC: Pain (0-20) | 4 mo | 100 | 82.8 (NR) | 98 | 84 (NR) | -0.7 (-4.8, 3.4) | NR |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Monticone, 2013, 23063624, Italy | Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Pain (0-100) | 6 mo | 55 | NR | 55 | NR | **10.34 (4.34, 16.35)** | **NR** |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Pain (0-100) | 12 mo | 55 | NR | 55 | NR | **9.56 (4.58, 14.54)** | **NR** |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | VAS (0-10) | 6 mo | 55 | NR | 55 | NR | **-1.5 (-2, -1)** | **NR** |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | VAS (0-10) | 12 mo | 55 | NR | 55 | NR | **-1.0 (-1.6, -0.5)** | **NR** |
| Moutzouri, 2018, 29473481, Greece | Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | VAS (0-10) | 3.5 mo | 25 | 0.7 (0.7) | 26 | 2.4 (0.8) | **-1.7 (-2, -1.4)B** | **NR** |
| Petersen, 2018, 29294078, Netherlands | Exercise & acupuncture | Exercise | High | KOOS: Pain (0-100) | 3 mo | 82 | N with success (%) 56 (67) | 83 | N with success (%) 60 (73) | RR 0.73 (1.09, 0.89) | 0.259 |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | KOS: Pain (0-5)F | 3 mo | 92 | 1.08 (NR) | 78 | 1.11 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | KOS: Pain (0-5) | 12 mo | 61 | 0.89 (NR) | 68 | 0.82 (NR) | NR | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | KOOS: Pain (0-100) | 6.5 mo | 48 | 87 (11) | 48 | 71 (15) | 1 (-5, 8) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | KOOS: Pain (0-100) | 6.5 mo | 48 | 73 (19) | 48 | 70 (21) | 3 (-6, 13) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | VAS (0-10) | 6.5 mo | 48 | 0 (1) | 48 | 1 (0) | 0 (-1, 1) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | WOMAC: Pain (0-20) | 12 mo | 53 | 38 (NR) | 55 | 37 (NR) | NR | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, CI = confidence interval, EQ-5D = EuroQuol, KOS = Knee Outcome Survey, KOOS = Knee injury and osteoarthritis outcome score, min = minute, mo = month, NMES = neuromuscular electrical stimulation, NR = not reported, PENS = patterned electrical neuromuscular stimulation, PMID = PubMed identifier, RR = relative risk, RoB = risk of bias, SD = standard deviation, SF-36 = 36-item short form survey, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index, VAS = visual analogue scale, w = weeks.

A Time from surgery

B Calculated

C During last 48 hours

D Before the functional activity

E Knee pain during loading

F Measured with question from the Knee Outcome Survey (designed for Activities of Daily Living) on pain “How does pain affect the function of your knee during daily activities?” Scores ranged from 0 (pain prevents me from all activities) to 5 (pain has no effect on daily activities).

**Range of motion**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation | Supervised rehabilitation | High | Active knee ROM: Extension and flexion (deg) | 6 mo | NR | NR (NR) | NR | NR (NR) | <10% MD | NR |
| Technological assisted rehabilitation | Supervised rehabilitation | High | Active knee ROM: Extension and flexion (deg) | 12 mo | NR | NR (NR) | NR | NR (NR) | <10% MD | NR |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Extension (deg) | 3 mo | 77 | -0.09 (2.97) | 76 | 0.06 (2.37) | -0.2 (-0.8, 0.5)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Extension (deg) | 6 mo | 71 | -1.38 (1.66) | 71 | -0.90 (2.62) | -0.5 (-1.0, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Extension (deg) | 12 mo | 71 | -2.18 (2.43) | 67 | -1.76 (2.28) | -0.4 (-1, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Flexion (deg) | 3 mo | 77 | 123.79 (9.1) | 76 | 123.71 (8.97) | 0.1 (-1.9, 2.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Flexion (deg) | 6 mo | 71 | 127.10 (6.57) | 71 | 127.45 (7.88) | -0.4 (-2.1, 1.4)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Active knee ROM: Flexion (deg) | 12 mo | 71 | 129.28 (8.89) | 67 | 128.27 (8.61) | 1 (-1.1, 3.1)B | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | Active knee ROM: Extension and flexion (deg) | 3 mo | 26 | 114.1 (2.36) | 29 | 111.2 (1.58) | NR | 0.09 |
| Leg-press group | Physiotherapy group | High | Passive knee ROM: Extension and flexion(deg) | 3 mo | 26 | 116.2 (2.46) | 29 | 112.8 (1.51) | 3.4 (2.6, 4.2)B | 0.30 |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | Usual physiotherapy | Moderate | Active knee ROM: Extension and flexion: (deg) | 9 mo | 29 | 118 (7) | 28 | 114 (17) | adj 1(-4, 7) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | Passive knee ROM: Extension (deg) | 3 mo | 30 | -0.3 (1.3) | 30 | -0.5 (1.5) | 0.2 (-0.3, 0.7)B | NR |
| NMES & exercise | Exercise | High | Passive knee ROM: Flexion (deg) | 3 mo | 30 | 113.2 (7.7) | 30 | 110.5 (7.9) | 2.7 (-0.1, 5.5)B | NR |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | Active knee ROM: Extension (deg) | 12 mo | 112 | -1.6 (0.4) | 98 | Mean (SE) -2.7 (0.4) | NR | NR |
| Outpatient exercise group | Usual care | Moderate | Active knee ROM: Flexion (deg) | 12 mo | 112 | 109.2 (0.9) | 98 | Mean (SE) 109.6 (1) | NR | NR |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation group | Control | Moderate | Active knee ROM: Flexion (deg) | 6 mo | 36 | Lower limit mean (SD); upper limit mean( SD) (6 , 36 , 3) | 38 | Lower limit mean(SD); upper limit mean(SD) (6 , 36 , 3) | NR | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Active knee ROM: Flexion (deg) | 12 mo | 36 | Lower limit mean(SD); upper limit mean(SD) (5, 45, 4) | 38 | Lower limit mean (SD); upper limit mean (SD) (4, 44, 4) | NR | NR |
| Li, 2019, 31003647, China | Tai chi | Control | Moderate | Knee ROM (active/passive unspecified): Extension (deg) | 3 mo | 54 | 1.5 (0.3) | 53 | 1.9 (0.2) | **-0.4 (-0.5, -0.3)B** | **0.59** |
| Tai chi | Control | Moderate | Knee ROM (active/passive unspecified): Flexion (deg) | 3 mo | 54 | 112.1 (14.8) | 53 | 110 (12.9) | 2.1 (-1.6, 5.8)B | 0.62 |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Active Knee ROM: Flexion and extension (deg) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.9 |
| Group-based rehabilitation | Supervised home-exercises | High | Knee ROM flexion and extension (deg) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.5 |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | Knee ROM (active/passive unspecified): Extension (deg) | 4 mo | 100 | -3.4 (NR) | 98 | -3.6 (NR) | 0.01 (-1, 1) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Knee ROM (active/passive unspecified): Flexion (deg) | 4 mo | 100 | 112.4 (NR) | 98 | 111.5 (NR) | 1.1 (-2.1, 4.3) | NR |
| Moutzouri, 2018, 29473481, Greece | Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | Active knee ROM extension: (deg) | 3.5 mo | 25 | 0.2 (1.1) | 26 | -1.6 (0.9) | 1.8 (1.4, 2.2)B | ns |
| Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | Active knee ROM flexion: (deg) | 3.5 mo | 25 | 107.3 (6.9) | 26 | 103.7 (6.9) | **3.6 (0.9, 6.3)B** | **< 0.005** |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | Active knee ROM: Extension (deg) | 3 mo | 92 | 1.8 (NR) | 78 | 2.0 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Active knee ROM: Extension (deg) | 12 mo | 61 | 0.4 (NR) | 68 | 0.3 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Active knee ROM: Flexion (deg) | 3 mo | 92 | 114.7 (NR) | 78 | 115.2 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Active knee ROM: Flexion (deg) | 12 mo | 61 | 119 (NR) | 68 | 120.9 (NR) | NR | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | Knee ROM extension (deg) | 6.5 mo | 48 | 0 (1) | 48 | 0 (2) | -1 (-3, 2) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | Knee ROM flexion (deg) | 6.5 mo | 48 | 121 (6) | 48 | 118 (9) | 1 (-4, 6) | NR |
| Tousignant, 2011, 21398389, Canada | Telerehabilitation | Home care/outpatient clinic | Moderate | Knee ROM (active/passive unspecified): Extension (deg) | 4 mo | 21 | -2.1 (NR) | 20 | -1.8 (NR) | NR | NR |
| Telerehabilitation | Home care/outpatient clinic | Moderate | Knee ROM (active/passive unspecified): Flexion (deg) | 4 mo | 21 | 115.2 (NR) | 20 | 109.7 (NR) | NR | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | Active knee ROM: Extension deficit (deg) | 12 mo | 53 | 14.9 (NR) | 55 | 14.3 (NR) | NR | NR |
| Home exercise | Control | Moderate | Passive knee ROM Extension deficit (deg) | 12 mo | 53 | 8.7 (NR) | 55 | 7.8 (NR) | NR | NR |
| Home exercise | Control | Moderate | Active knee ROM: Flexion (deg) | 12 mo | 53 | 113.4 (NR) | 55 | 114.8 (NR) | NR | 0.98 |
| Home exercise | Control | Moderate | Passive knee ROM: Flexion (deg) | 12 mo | 53 | 117.2 (NR) | 55 | 116.9 (NR) | NR | 0.86 |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, CI = confidence interval, deg = deg, mo = month, ns = not significant, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion, SD = standard deviation.

A Time from surgery

B Calculated

**Strength**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the hamstring (Nm/kg) | 3 mo | 77 | 0.76 (0.28) | 76 | 0.74 (0.26) | 0.02 (-0.04, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the hamstring (Nm/kg) | 6 mo | 71 | 0.8 (0.29) | 71 | 0.8 (0.27) | 0 (-0.1, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the hamstring (Nm/kg) | 12 mo | 70 | 0.84 (0.31) | 67 | 0.85 (0.29) | -0.01 (-0.1, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the quadricep (Nm/kg) | 3 mo | 77 | 1.21 (0.42) | 76 | 1.15 (0.4) | 0.03 (-0.1, 0.2)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the quadricep (Nm/kg) | 6 mo | 71 | 1.35 (0.46) | 71 | 1.35 (0.4) | 0 (-0.1, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Strength: Isometric peak contraction of the quadricep (Nm/kg) | 12 mo | 70 | 1.42 (0.47) | 67 | 1.43 (0.44) | -0.01 (-0.1, 0.1)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Quadriceps activation (%) | 3 mo | 67 | 82.77 (10.78) | 63 | 79.94 (13.78) | 2.8 (-0.2, 5.9)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Quadriceps activation (%) | 6 mo | 61 | 80.87 (12.01) | 62 | 82.92 (9.55) | -2.1 (-4.8, 0.7)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Quadriceps activation (%) | 12 mo | 62 | 83.39 (11.73) | 59 | 83.73 (10.12) | -0.3 (-3.1, 2.4)B | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | Strength: Isometric peak knee extension (Nm/kg) | 3 mo | 26 | 1.0 (0.09) | 29 | 0.9 (0.06) | NR | 0.16 |
| Leg-press group | Physiotherapy group | High | Strength: Leg press (N/kg) | 3 mo | 26 | 10.3 (1.06) | 29 | 9.1 (0.7) | NR | 0.19 |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | 27 individual physiotherapy sessions | Moderate | Strength/function: Index of muscle functionC | 9 mo | 29 | 11 (7) | 28 | 12 (7) | Adj MD -1 (-3, 2) | NR |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | Strength: Isometric knee extension (Nm) | 12 mo | 112 | 77.2 (3.3) | 98 | Mean (SE) 74.6 (3.4) | NR | NR |
| Outpatient exercise group | Usual care | Moderate | Strength: Isometric knee flexion (Nm) | 12 mo | 112 | 42.8 (2.3) | 98 | Mean (SE) 44.3 (2.5) | NR | NR |
| Heikkilä, 2017, 28119232, Finland | Home exercise | Control | High | Strength: Isometric knee extension (N) | 14 mo | 53 | 350 (130) | 55 | 280 (150) | **70 (32.5, 107.5)B** | **NR** |
| Home exercise | Control | High | Strength: Isometric knee flexion (N) | 14 mo | 53 | 150 (50) | 55 | 120 (50) | **30 (16.7, 43.3)B** | **NR** |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation group | Control | Moderate | Strength: Peak torque extension (Nm)D | 6 mo | 29 | 88.8 (25) | 33 | 93.8 (30.4) | -5 (-14.8, 4.8)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Peak torque extension (Nm)D | 12 mo | 29 | 98 (28.1) | 32 | 99.2 (39.1) | -1.2 (-13.4, 11)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Relative peak torque extension (Nm/kg) | 6 mo | 28 | 1.15 (0.44) | 29 | 1.14 (0.39) | 0.01 (-0.1, 0.2)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Relative peak torque extension (Nm/kg) | 12 mo | 29 | 1.23 (0.43) | 32 | 1.21 (0.49) | 0.02 (-0.1, 0.2)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Relative peak torque flexion (Nm/kg) | 6 mo | 28 | 0.80 (0.27) | 29 | 0.83 (0.24) | -0.03 (-0.1, 0.1)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Relative peak torque flexion (Nm/kg) | 12 mo | 29 | 0.85 (0.3) | 32 | 0.78 (0.21) | 0.1 (-0.03, 0.2)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Hamstring/  quadricep ratio (proportion) | 6 mo | 29 | 0.74 (0.24) | 33 | 0.77 (0.22) | -0.03 (-0.1, 0.1)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Strength: Hamstring/  quadricep ratio (proportion) | 12 mo | 29 | 0.70 (0.18) | 31 | 0.79 (0.71) | -0.1 (-0.3, 0.1)B | NR |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Strength: Asymmetry leg extensor power (W/kg)E | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.1 |
| Group-based rehabilitation | Supervised home-exercises | High | Strength: Asymmetry leg extensor power (W/kg)E | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.5 |
| Group-based rehabilitation | Supervised home-exercises | High | Strength: Peak force (W/kg) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.2 |
| Group-based rehabilitation | Supervised home-exercises | High | Strength: Peak force (W/kg) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.1 |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | Strength: Leg extension power (W/kg) | 3 mo | 42 | Median 0.7 (NR) | 39 | Median 0.72 (NR) | NR | NR |
| Home-visit physiotherapy | Usual care | High | Strength: Leg extension power (W/kg) | 12 mo | 38 | Median 0.87 (NR) | 42 | Median 0.87 (NR) | NR | NR |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | Strength: Isokinetic knee extension at 30 deg flexion (Nm) | 4 mo | 100 | 74.6 (NR) | 98 | 76.4 (NR) | 0.4 (-9.7, 10.4) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Strength: Isokinetic knee extension at 60 deg flexion (Nm) | 4 mo | 100 | 105.4 (NR) | 98 | 105.7 (NR) | -1.1 (-7.9, 5.7) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Strength: Isokinetic knee flexion at 30 deg flexion (Nm) | 4 mo | 100 | 74.6 (NR) | 98 | 76.4 (NR) | -1.1 (-7.9, 5.7) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Strength: Isokinetic knee flexion at 60 deg flexion (Nm) | 4 mo | 100 | 105.4 (NR) | 98 | 105.7 (NR) | 0.4 (-9.7, 10.4) | NR |
| Moutzouri, 2018, 29473481, Greece | Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | Strength: Peak force (N) | 3.5 moF | 25 | 67.5 (17.4) | 26 | 55.4 (23.5) | **12.1 (3.9, 20.2)**B | **NR** |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | Normalized maximum voluntary isometric contraction (N/kg/m2) | 3 mo | 92 | 17.35 (NR) | 78 | 19.05 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Normalized maximum voluntary isometric contraction (N/kg/m2) | 12 mo | 61 | 20.60 (NR) | 68 | 22.64 (NR) | NR | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | Strength: Quadricep (N/kg/m2)G | 6 mo | 48 | 4.0 (1.6) | 48 | 4.1 (1.7) | 0.0 (-0.5, 0.5) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | Strength: Quadricep (N/kg/m2) | 6 mo | 48 | 6.6  (3.0) | 48 | 6.9  (3.4) | -0.4 (-1.6, 0.8) | NR |
| Shanb, 2014, CN-01041112, Saudi Arabia | Active exercise training program & biofeedback | Active exercise training program | High | Central activation ratioH (0-1) | 4 mo | 21 | 0.89 (0.04) | 24 | 0.93 (0.03) | -0.04 (-0.1, -0.03)B | 0.97 |
| Active exercise training program & biofeedback | Active exercise training program | High | Strength: Quadriceps isometric peak torque | 4 mo | 21 | 2.31 (0.66) | 24 | 2.3 (0.32) | **0.01 (-0.2, 0.3)B** | **0.01** |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | Strength: Isometric knee extension (Kg) | 12 mo | 53 | 33.3 (NR) | 55 | 27.9 (NR) | NR | 0.50 |
| Home exercise | Control | Moderate | Strength: Isometric knee flexion (Kg) | 12 mo | 53 | 14.7 (NR) | 55 | 12.5 (NR) | **NR** | **0.009** |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, CI = confidence interval, N = Newton, Nm = Newton meters, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, SE = standard error.

A Time from surgery

B Calculated

C Functional test comprising of 13 items evaluating muscle strength, balance and endurance in lying, sitting and standing positions, sum score is 40, best is 0

D Measured with the Lido Active Multijoint Rehabilitation System

E Measured using the Nottingham Leg Extensor Power Rig

F Defined as 14 weeks

G Normalized to body mass index

H Larger is better; central activation ratio of 1.0 indicates complete activation of the muscle with no increase of the maximal voluntary force being detected during the electrical stimulation

**Energy and vigor**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Mitchell, 2005, 15869558, UK | Home | Hospital | High | SF-36: Vitality (0-100) | 3 mo | 57 | 50.7 (19.5) | 57 | 48.2 (23.7) | 3.4 (-3.5, 10.3) | 0.33 |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SF-36 = 36-Item short form survey, SD = standard deviation.

A Time from surgery

**Emotional functioning**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | SF 12: Mental health  (0-100) | 3 mo | 75 | 56.73 (7.29) | 75 | 57.05 (6.86) | -0.3 (-1.9, 1.3)B | >0.05 |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | SF 12: Mental health  (0-100) | 6 mo | 71 | 55.76 (7.26) | 68 | 56.64 (6.20) | -0.9 (-2.5, 0.7)B | >0.05 |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | SF 12: Mental health  (0-100) | 12 mo | 67 | 55.76 (6.48) | 61 | 57.83 (3.58) | -2.1 (-3.4, -0.7)B | >0.05 |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | SF-36: Mental health  (0-100) | 3 mo | 30 | 65.1 (12.1) | 30 | 60.9 (15.8) | 4.2 (-0.9, 9.3)B | NR |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | SF-36: Mental health  (0-100) | 12 mo | 179 | 54.3 (0.7) | 169 | Mean 53.1 | NR | NR |
| Li, 2019, 31003647, China | Tai chi chuan exercise | Control | Moderate | SF-36: Mental health  (0-100) | 3 moC | 54 | 58.5 (1.5) | 53 | 54.1 (1.7) | **4.4 (4.0, 4.8)B** | **0.03** |
| Mitchell, 2005, 15869558, UK | Hospital | Home | High | SF-36: Emotional role functioning  (0-100) | 3 mo | 57 | 45.6 (44.8) | 57 | 48.0 (46.7) | Adj MD 4.1 (-10.9, 19.0) | 0.592 |
| Hospital | Home | High | SF-36: Social functioning (0-100) | 3 mo | 57 | 60.8 (33.1) | 57 | 64.1 (26.6) | Adj MD 6.7 (-3.4, 16.7) | 0.193 |
| Hospital | Home | High | SF-36: Mental health  (0-100) | 3 mo | 57 | 71.2 (20.0) | 57 | 68.0 (20.4) | Adj MD -2.9 (-9.3, 3.5) | 0.368 |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | SF-36: Mental health  (0-100) | 3 mo | 92 | 56.77 (NR) | 78 | 57.17 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | SF-36: Mental health  (0-100) | 12 mo | 61 | 57.16 (NR) | 68 | 56.63 (NR) | NR | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation & hip strengthening exercises | Standard rehabilitation & general functional exercise | Moderate | SF-36: Mental health  (0-100) | 6.5 mo | 48 | 57 (6) | 48 | 55 (8) | 1 (-4, 5) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | SF-36: Mental health  (0-100) | 12 mo | 53 | 47 (NR) | 55 | 48 (NR) | NR | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SF-12 = 12-item short form survey, SF-36 = 36-item short form survey, SD = standard deviation.

A Time from surgery

B Calculated

C Defined as 14 weeks

Activity and Participation Outcomes – Acute rehabilitation

**Physical function and activities of daily living**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Avramidis, 2011, 21410130, Greece | TENS plus Physiotherapy | Physiotherapy | Moderate | Knee Society Score: Function | 3 mo | 12 | 150.94 (14.26) | 19 | 141.74 (12.38) | **9.2 (2.0, 16.4)**B | **0.003** |
| TENS plus Physiotherapy | Physiotherapy | Moderate | Knee Society Score: Function | 12 mo | 15 | 159.63 (12.69) | 21 | 156.40 (12.11) | 3.2 (2.7, 9.1)B | 0.349 |
| TENS plus Physiotherapy | Physiotherapy | Moderate | SF-36: Physical component  (0-100) | 3 mo | 12 | 46.6 (5.13) | 19 | 37.63 (6.43) | **9 (6.1, 11.9)**B | **<0.001** |
| TENS plus Physiotherapy | Physiotherapy | Moderate | SF-36: Physical component  (0-100) | 12 mo | 15 | 53.9 (4.26) | 21 | 47.37 (3.84) | **6.5 (4.6, 8.5)**B | **<0.001** |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | Oxford knee score (0-48) | 6.5 mo | 79 | 36.9 (95 % CI 35, 38.7) | 80 | 34.8 (95 % CI 32.9, 36.7) | 0.54 (-2.26,3.33) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | Oxford knee score (0-48) | 12 mo | 79 | 36.5 (95 % CI 34.6, 38.4) | 77 | 37 (95 % CI 35.2, 38.9) | 2.06 (-0.59, 4.71) | NR |
| Chan, 2018, 29372260, Singapore | Discharge to home | Discharge to community hospitals | Moderate | Oxford knee score (0-48) | 6 mo | 967 | 19.6 (95 % CI 19.3, 20.0) | 98 | 21.5 (95 % CI 20.3, 22.6) | **1.8 (0.6,3.0)** | **0.003** |
| Discharge to home | Discharge to community hospitals | Moderate | Oxford knee score (0-48) | 24 mo | 801 | 18.5 (95 % CI 18.1, 18.9) | 78 | 22.0 (95 % CI 20.9, 23.2) | **-3.5 (-4.8, -2.3)** | **<0.0001** |
| Discharge to home | Discharge to community hospitals | Moderate | SF-36: Physical functioning (0-100) | 6 mo | 967 | 66.9 (95 % CI 65.6, 68.2) | 98 | 59.1 (95 % CI 55.0, 63.1) | **7.8 (3.5, 12.0)** | **0.0004** |
| Discharge to home | Discharge to community hospitals | Moderate | SF-36: Physical functioning (0-100) | 24 mo | 801 | 69.5 (95 % CI 67.9, 71.0) | 78 | 57.2 (95 % CI 52.2, 62.1) | **12.3 (7.1, 17.5)** | **<0.0001** |
| Discharge to home | Discharge to community hospitals | Moderate | Knee Society Clinical Rating System: Function domain | 6 mo | 967 | 71.0 (95 % CI 69.9, 72.1) | 98 | 62.3 (95 % CI 58.8, 65.9) | **8.7(4.9, 12.4)** | **<0.0001** |
| Discharge to home | Discharge to community hospitals | Moderate | Knee Society Clinical Rating System: Function domain | 24 mo | 801 | 73.9 (95 % CI 72.6 , 75.2) | 78 | 60.9 (95 % CI 56.7, 65.1) | **-13.0(-17.4,08.6)** | **<0.0001** |
| Eymir,  2020,  32778907  Turkey | Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Level of Assistant Scale: TotalC | 3 mo | 55 | 20.7 (2.1) | 58 | 20.3 (2.0) | -0.4 (-0.9, 0.1) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Level of Assistant Scale: Supine to sit | 3 mo | 55 | 5.7 (0.6) | 58 | 5.7 (0.6) | 0 (-0.2, 0.2) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Level of Assistant Scale: Sit to stand | 3 mo | 55 | 5.3 (0.6) | 58 | 5.2 (0.7) | 0.4 (0.2, 0.6) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Level of Assistant Scale: Ambulation | 3 mo | 55 | 5.5 (0.6) | 58 | 5.4 (0.7) | -0.1 (-0.3, 0.07) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Level of Assistant Scale: Stair climbing | 3 mo | 55 | 4.1 (1.0) | 58 | 3.8 (0.9) | -0.3 (-0.5, -0.05) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Total (0-80)D | 3 mo | 55 | 77.8 (11.4) | 58 | 75.3 (12.4) | -2.5 (-5.6, 0.6) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Pain (0-30) | 3 mo | 55 | 22.9 (5.4) | 58 | 23.8 (5.3) | 0.9 (-0.5, 2.3) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Function (0-22) | 3 mo | 55 | 14.3 (3.7) | 58 | 14.0 (3.8) | -0.3 (-1.3, 0.7) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: ROM (0-18) | 3 mo | 55 | 13.0 (1.1) | 58 | 13.0 (1.2) | 0 (-0.3, 0.3) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Muscle strength (0-10) | 3 mo | 55 | 9.0 (1.0) | 58 | 9.0 (1.0) | 0.1 (-0.3, 0.3) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Deformation (unclear) | 3 mo | 55 | 0.7 (1.8) | 58 | 1.0 (2.0) | 0.3 (-0.2, 0.8) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | Hospital for Special Surgery: Instability | 3 mo | 55 | 8.7 (0.9) | 58 | 8.9 (1.0) | 0.2 (-0.05, 0.5) | ns |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | WOMAC: Physical function  (0-68) | 6 mo | 53 | 4.36(NR) | 49 | 5.75 (NR) | NR | 0.04 |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | WOMAC: Physical function (0-68) | 3 mo | 21 | 51.9 (10.6) | 22 | 55.3 (8.3) | -3.4 (-9.2, 2.5) | NR |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Knee Society Score: Function | 3 mo | 21 | 69 (15) | 22 | 69 (20) | 0 (-11, 11) | NR |
| Liebs, 2010, 20360503,  Germany | Ergometer cycling | Control | Moderate | SF-36: Physical component  (0-100) | 24 mo | 66 | 42.3 (9.4) | 52 | 40.4 (9.7) | NR | 0.275 |
| Ergometer cycling | Control | Moderate | WOMAC: Physical function  (0-68) | 24 mo | 66 | 20.4 (21.2) | 52 | 16.4 (18.2) | NR | 0.328 |
| Ergometer cycling | Control | Moderate | Lequesne hip and knee score (0-24) | 24 mo | 66 | 7.6 93.8) | 52 | 7.5 (4.4) | NR | 0.807 |
| Liebs, 2012, 22196125,  Germany | Early Aquatic therapy | Late Aquatic therapy | Moderate | SF-36: Physical component  (0-100) | 24 mo | 66 | 43.9 (9.4) | 69 | 41 (9.7) | 0.31 (NR, NR) | 0.131 |
| Early Aquatic therapy | Late Aquatic therapy | Moderate | WOMAC: Physical function  (0-68) | 24 mo | 66 | 13.8 (13.6) | 69 | 20.7 (21.3) | 0.39 (NR, NR) | 0.117 |
| Early Aquatic therapy | Late Aquatic therapy | Moderate | Lequesne hip and knee score (0-24) | 24 mo | 66 | 6.8 (3.8) | 69 | 7.4 (3.8) | 0.15 (NR, NR) | 0.361 |
| Naylor, 2017, 28899328, Australia | Inpatient rehabilitation | No inpatient rehabilitation | High | Oxford knee score (0-48) | 3 mo | 129 | Median (IQR) 40 (34,43) | 129 | Median (IQR) 40 (34, 43) | 0 (-1.2, 1.2)B | NR |
| Inpatient rehabilitation | No inpatient rehabilitation | High | Oxford knee score (0-48) | 12 mo | 129 | Median (IQR) 44 (42, 45) | 129 | Median (IQR) 44 (42, 46) | 0 (-0.4, 0.4)B | NR |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise) protocol | Moderate | Oxford knee score (0-48) | 4 mo | 28 | 39.3 (6.1) | 28 | 37.6 (4.8) | 1.7 (-0.4, 3.8)B | NR |
| Stevens Lapsley, 2012, 22095207, USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | SF-36: Physical component  (0-100) | 12 mo | 25 | 52.6 (2.9) | 30 | 50.7 (7.4) | 1.9 (-0.4, 4.2)B | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: ACSE = active heal slide exercise, CI = confidence interval, CPM = continuous passive motion, IQR = interquartile range, mo = month, NMES = neuromuscular electrical stimulation, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, SF-36 = 36-Item short form survey, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Calculated

C The Iowa Level of Assistance Scale was used to assess four functional activities (moving from the supine position to the sitting position, rising from the sitting position, walking 4.57 m, and ascending and descending stairs for three steps). Activities are scored between 0–6 (6=independence). The total score is the sum of the four activity scores.

D Total Hospital for Special Surgery score is obtained by summing all the item scores and subtracting scores related to walking aids, loss of knee extension and varus/valgus deformity.

**Transfers**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Li, 2014, 23412304, China | Robot-assisted training | Control (CPM) | High | 10m sitting standing time(s) | 6 mo | 30 | 8.7 (1.7) | 30 | 11.1 (1.9) | **-2.4 (-3.0, -1.8)B** | **<0.05** |
| Robot-assisted training | Control (CPM) | High | 10m sitting standing time(s) | 12 mo | 30 | 8.7 (1.4) | 30 | 11.5 (2.1) | **-2.8 (-3.5, -2.1) B** | **<0.05** |
| Tsukada, 2020, 31723080, Japan | Standard rehabilitation & hybrid training system | Standard rehabilitation | Moderate | 10m sitting standing time (s) | 3 mo | 20 | 9 (NR) | 20 | 11 (NR) | NR | ns |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, CPM = continuous passive motion, mo = month, NR = not reported, ns = not significant, PMID = PubMed identifier, RoB = risk of bias, s = second, SD = standard deviation, SE = standard error.

A Time from surgery

B Calculated

**Balance**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Li, 2014, 23412304, China | Robot-assisted training | Traditional rehabilitation training | High | Berg Balance Scale | 6 mo | 30 | 53.9 (1.9) | 30 | 50.2 (2.2) | **3.7 (3, 4.4)B** | **<0.05** |
| Robot-assisted training | Traditional rehabilitation training | High | Berg Balance Scale | 12 mo | 30 | 54.5 (1.7) | 30 | 49.9 (2.4) | **4.6 (3.8, 5.4)B** | **<0.05** |
| Zapparoli,  2020,  32488010  Italy | Motor imagery & rehabilitation | Rehabilitation | High | Falls/near falls in the past 12 mo | 24 mo | 24 | NR | 24 | NR | Exponential effect size (95% CI): 1.75 (1.31, 2.29)  Standardized mean difference effect size (95%CI): 0.96 (0.39, 1.72) | **<0.001** |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, NR = not reported, ns = not significant, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation.

A Time from surgery

B Calculated

**Mobility**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Home program | Hospital inpatient rehabilitation | Moderate | 6MWT (m) | 12 mo | 80 | 408.8 (95 % CI 371.6 , 438) | 79 | 391.2 (95 % CI 358.1 , 424.4) | 13.54 (-13.61, 40.69,) | NR |
| Home program | Hospital inpatient rehabilitation | Moderate | 15m walk test (s) | 6.5 mo | 80 | 12.0 (95% CI 10.9,13.1) | 79 | 12.5 (95 % CI 11.4 , 13.6) | 0.50 (-2.01, 1.01) | NR |
| Home program | Hospital inpatient rehabilitation | Moderate | 15m walk test (s) | 12 mo | 77 | 12.7 (95% CI 11.6 to 13.8) | 79 | 12.3 (95 % CI 11.2 , 13.4) | -0.42 (-1.10, 1.94) | NR |
| Eymir,  2020,  32778907  Turkey | Standard physiotherapy & AHS | Physiotherapy & CPM | High | Iowa Ambulation Velocity Scale (s)DB | 3 mo | 55 | 17.2 (14.1) | 58 | 23.3 (15.6) | 6.1 (2.2, 9.9) | ns |
| Standard physiotherapy & AHS | Physiotherapy & CPM | High | 10MWT (m) | 3 mo | 55 | 12.9 (9.9) | 58 | 17.6 (11.6) | 4.7 (1.8, 7.5) | ns |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | 6MWT (m) | 6mo | 53 | 407.24 (NR) | 49 | 407.24 (NR) | NR | ns |
| Water-based rehabilitation | Land-based rehabilitation | Moderate | Stair climb power (W)C | 6 mo | 53 | 164.35 (NR) | 49 | 146.76 (NR) | NR | NR |
| Li, 2014, 23412304, China | Robot-assisted training | Control | High | 6MWT (m) | 6 mo | 30 | 668 (46.3) | 30 | 604.4 (36.9) | **63.6 (48.4, 78.8)D** | **<0.05** |
| Robot-assisted training | Control | High | 6MWT (m) | 12 mo | 30 | 681.9 (37.7) | 30 | 608.5 (34.8) | **73.4 (60.4, 86.4)D** | **<0.05** |
| Robot-assisted training | Control | High | Functional ambulation category (0-5) | 6 mo | 30 | 5 (NR) | 30 | 5 (NR) | NR | NR |
| Robot-assisted training | Control | High | Functional ambulation category (0-5) | 12 mo | 30 | 5 (NR) | 30 | 5 (NR) | NR | NR |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise] protocol | Moderate | 6MWT (m) | 4 mo | 28 | 514.0 (78.5) | 28 | 488.3 (89.7) | 25.7 (19.5, 70.8 | 0.259 |
| Pedaling-based protocol | Non-pedaling (multi-exercise] protocol | Moderate | 10m walk test (m/s) | 4 mo | 28 | 1.54 (0.24) | 28 | 1.50 (0.25) | 0.04 (-0.01, 0.12) | 0.592 |
| Stevens Lapsley,2012, 22095207, USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | 6MWT (m) | 12 mo | 25 | 524.6 (81.6) | 30 | 477.8 (94) | **46.8 (0.4, 93.2)D** | **<0.05** |
| Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Stair climb test (s)E | 12 mo | 25 | 11.5 (4.3) | 30 | 14.8 (9.3) | **-3.3 (-7, 0.4)D** | **<0.05** |
| Tsukada, 2020, 31723080, Japan | Standard rehabilitation & hybrid training system | Standard rehabilitation | Moderate | Stair climb test (s)F | 3 mo | 20 | 13 (NR) | 20 | 16 (NR) | NR | ns |

Statistically significant effect sizes are in bold text.

Abbreviations: AHS = active heel slides, CI = confidence interval, mo = month, m = meter, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, s= second, SD = standard deviation, SE = standard error, W = watt.

A Time from surgery

B Speed at a distance of 13.4m

C The time required to ascend 18 stairs (flights of 8 to 10 stairs, separated by a small landing) as fast as possible using handrails and walking aids as required. Stair climb power was calculated using this time, combined with patient’s body mass index, total stair height, and ascent time.

D Calculated

D Speed at a distance of 13.4m

E Defined as the total time to ascend a flight of stairs, turn around and descend

F Defined as the total time to ascend 18 stairs as quickly as possible

**Timed Up and Go**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Eymir,  2020,  32778907  Turkey | Standard physiotherapy & AHS | Physiotherapy & CPM | High | TUG (s) | 3 mo | 55 | 15.2 (13.1) | 58 | 22.8 (18.4) | 7.6 (3.3, 11.8) | ns |
| Piqueras, 2013, 23474735, Spain | Interactive virtual telerehabilitation system | Conventional outpatient physical therapy | Moderate | TUG (s) | 3 mo | 68 | NR (NR) | 65 | NR (NR) | **NR** | **0.020** |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise) protocol | Moderate | TUG (s) | 4 mo | 28 | 6.9 (1.3) | 28 | 7.1 (1.3) | -0.2 (-0.7, 0.3)B | NR |
| Stevens Lapsley,2012, 22095207,USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | TUG (s) | 12 mo | 25 | 6.7 (1.7) | 30 | 8.3 (2.8) | **-1.6 (-2.5, -0.7)**B | **NR** |
| Tsukada, 2020, 31723080, Japan | Standard rehabilitation & hybrid training system | Standard rehabilitation | Moderate | TUG (s) | 3 mo | 20 | 9 (NR) | 20 | 11 (NR) | NR | ns |

Statistically significant effect sizes are in bold text.

Abbreviations: CI = confidence interval, CPM = continuous passive motion, mo = month, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, s = second, SD = standard deviation, TUG = timed up and go test.

A Time from surgery

B Calculated

Activity and Participation Outcomes – Post-acute rehabilitation

**Physical function and activities of daily living**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Artz, 2017, 27068368,UK | Group-based exercise | Usual care | High | UCLA activity scale | 3 mo | 19 | 4.9 (1.7) | 12 | 4.3 (1.1) | 0.6 (-0.1, 1.3)B | NR |
| Group-based exercise | Usual care | High | UCLA activity scale | 6 mo | 21 | 5.2 (1.5) | 15 | 4.5 (1.9) | 0.7 (-0.1, 1.5)B | NR |
| Group-based exercise | Usual care | High | KOOS: ADL (0-100) | 3 mo | 19 | 81.2 (15.9) | 12 | 76.1 (18.5) | 5.1 (-4.2, 14.4)B | NR |
| Group-based exercise | Usual care | High | KOOS: ADL (0-100) | 6 mo | 21 | 79.6 (23.4) | 15 | 73.5 (26.4) | 6.1 (-5.9, 18.1)B | NR |
| Group-based exercise | Usual care | High | KOOS: Sport/rec (0-100)C | 3 mo | 19 | 39.2 (29.4) | 12 | 27.9 (20.2) | 11.3 (-1.1, 23.7)B | NR |
| Group-based exercise | Usual care | High | KOOS: Sport/rec (0-100)C | 6 mo | 21 | 46.3 (35.4) | 15 | 37.1 (25.7) | 9.2 (-5, 23.4)B | NR |
| Group-based exercise | Usual care | High | LEFS | 3 mo | 19 | 55.8 (15.6) | 12 | 48.8 (17.4) | 7 (-1.8, 15.8)B | NR |
| Group-based exercise | Usual care | High | LEFS | 6 mo | 21 | 57.8 (15.2) | 15 | 45.0 (20.8) | **12.8 (3.6, 22.0)B** | **NR** |
| Group-based exercise | Usual care | High | Activities-specific balance confidence scaleD | 3 mo | 19 | 84.3 (15.2) | 12 | 79.0 (19.4) | 5.3 (-4.3, 14.9)B | NR |
| Group-based exercise | Usual care | High | Activities-specific balance confidence scaleD | 6 mo | 21 | 84.1 (17.3) | 15 | 80.7 (19.8) | 3.4(-5.6, 12.4)B | NR |
| DeJong,  2020,  32360105  USA | Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: ADL (0-100) | 6 mo | 70 | 90.7 (17.2) | 78 | 88.9 (15.2) | -1.8 (-5.5, 1.9) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: ADL (0-100) | 6 mo | 70 | 90.7 (17.2) | 76 | 90.5 (17.2) | -0.2 (-4.1, 3.7) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: ADL (0-100) | 6 mo | 70 | 90.7 (17.2) | 74 | 92.8 (8.1) | 2.1 (-1.8, 6.0) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: Sport/rec (0-100) | 6 mo | 70 | 53.3 (26.4) | 78 | 49.9 (29.6) | -3.4 (-9.8, 3.0) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: Sport/rec (0-100) | 6 mo | 70 | 53.3 (26.4) | 76 | 50.0 (28.2) | -3.3 (-9.5, 2.9) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: Sport/rec (0-100) | 6 mo | 70 | 53.3 (26.4) | 74 | 55.9 (25.5) | 2.6 (-3.4, 8.6) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | SF-12: Physical component | 3 mo | 30 | 68.5 (14.8) | 30 | 67.8 (14.5) | 0.7 (-4.5, 5.9)B | NR |
| NMES & exercise | Exercise | High | WOMAC: Physical function (0-68) | 3 mo | 30 | 44.5 (12.5) | 30 | 48.8 (16.5) | -4.3 (-9.6, 1.0)B | NR |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | QoL: SF-12 (physical component) | 12 mo | 179 | 42.7 (0.6) | 169 | Mean (SE) 43.2 (0.6) | NR | NR |
| Outpatient exercise group | Usual care | Moderate | WOMAC: Physical function (0-68) | 12 mo | 179 | 11.3 (0.7) | 169 | Mean (SE) 10.4 (0.7) | NR | 0.71 |
| Hamilton, 2020, 33051212,UK | Therapist led | Home-based exercises | Moderate | Oxford knee score (0-48) | 3 moE | 154 | 3.97 (2.46) | 150 | 4.44 (2.41) | **1.60 (0.05,3.16)** | **0.04** |
| Therapist led | Home-based exercises | Moderate | Oxford knee score (0-48) | 6 mo | 150 | 32.12 (8.81) | 151 | 30.34 (8.75) | 1.70 (-0.11,3.51) | 0.07 |
| Therapist led | Home-based exercises | Moderate | Oxford knee score (0-48) | 12 mo | 148 | 33.55 (10.06) | 156 | 31.57 (9.68) | 1.91 (-0.18,3.99) | 0.07 |
| Lenguerrand, 2020, 31033232, UK | Physical therapy and standard care | Standard care | Moderate | KOOS: ADL (0-100) | 12 mo | 66 | 82 (17) | 57 | 81 (20) | 1 (-3.7, 5.7)B | 0.291 |
| Physical therapy and standard care | Standard care | Moderate | KOOS: Sport/rec (0-100) | 12 mo | 61 | Median (IQR) 45 (25 , 75) | 55 | Median (IQR) 45 (25 , 65) | NR | 0.199 |
| Physical therapy and standard care | Standard care | Moderate | LEFS | 12 mo | 81 | 56 (19) | 83 | 53 (18) | 3 (-1.0, 7.0)B | NR |
| Li, 2019, 31003647, China | Tai chi exercise | Control | Moderate | SF-36: Physical component (0-100) | 3 moE | 54 | 54.2 (1.5) | 53 | 45.2 (1.9) | **9.0 (8.5, 9.5)B** | **0.01** |
| Tai chi exercise | Control | Moderate | WOMAC: Physical function (0-68) | 3 mo | 54 | 35.5 (3.2) | 53 | 41.6 (4.1) | **-6.1 (-7.1, -5.1)B** | **0.03** |
| Liao, 2015, 25552523, Taiwan | Functional plus balance rehabilitation | Functional rehabilitation | High | WOMAC: Physical function (0-68) | 32 w | 65 | 28.6 (8.1) | 65 | 22.4 (7.9) | **6.2 (4.3, 8.1)B** | **NR** |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training | Standard care | Moderate | WOMAC: Physical function (0-68) | 4 mo | 30 | 13.17 (3.78) | 30 | 21.72 (6.06) | **-8.6 (-10.4, -6.7)B** | **<0.001** |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Oxford knee score (0-48) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.7 |
| Group-based rehabilitation | Supervised home-exercises | High | Oxford knee score (0-48) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.7 |
| Group-based rehabilitation | Supervised home-exercises | High | SF-36: Physical function (0-100) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.7 |
| Group-based rehabilitation | Supervised home-exercises | High | SF-36: Physical function (0-100) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.5 |
| Minns Lowe, 2012, 22180446, U | Home-visit physiotherapy | Usual care | High | Oxford knee score (0-48) | 3 mo | 46 | Media (IQR) 33.5 (13) | 47 | Median (IQR) 34 (12) | Median diff -2.2 (-6.4, 2) | 0.3 |
| Home-visit physiotherapy | Usual care | High | Oxford knee score (0-48) | 6 mo | 42 | Median (IQR) 36 (12) | 44 | Median (IQR) 36 (13) | Median diff -0.05 (-4.6, 4.5) | 0.98 |
| Home-visit physiotherapy | Usual care | High | Oxford knee score (0-48) | 12 mo | 46 | Median (IQR) 40 (10) | 48 | Median (IQR) 38.5 (12) | Median diff 0.2 (-3.8, 4.2) | 0.94 |
| Home-visit physiotherapy | Usual care | High | KOOS: ADL (0-100) | 3 mo | 42 | Median (IQR) 69.9 (21) | 44 | Median (IQR) 75 (31) | **-7.1 (-12.1, - 2.1)B** | **NR** |
| Home-visit physiotherapy | Usual care | High | KOOS: ADL (0-100) | 6 mo | 41 | Median (IQR) 78.1 (26) | 41 | Median (IQR)72.1 (34) | **-6.0 (-11.8, -0.2)B** | **NR** |
| Home-visit physiotherapy | Usual care | High | KOOS: ADL (0-100) | 12 mo | 41 | Median (IQR) 85.3 (21) | 46 | Median (IQR) 89.4 (23) | 4.1 (-0.3, 8.4)B | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Sport/rec (0-100) | 3 mo | 18 | Median (IQR) 41.7 (25) | 22 | Median (IQR) 31.7 (57) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Sport/rec (0-100) | 6 mo | 28 | Median (IQR) 50 (44) | 30 | Media (IQR) 35 (35) | NR | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: Sport/rec (0-100) | 12 mo | 33 | Median (IQR) 60 (41) | 35 | Media (IQR) 50 (55) | NR | NR |
| Mitchell, 2005, 15869558, UK | Hospital | Home | High | SF-36: Physical component | 3 mo | 57 | 43.3 (27.6) | 57 | 41.6 (22.2) | Adj MD 2.5 (-6.3, 11.3) | 0.579 |
| Hospital | Home | High | SF-36: Physical function (0-100) | 3 mo | 57 | 23.2 (36.2) | 57 | 27.6 (37.1) | Adj MD 7.8 (-5.6, 21.2) | 0.249 |
| Hospital | Home | High | WOMAC: Physical function (0-68) | 3 mo | 57 | 24.4 (14.9) | 57 | 24.9 (13.4) | Adj Md -1.0 (-5.9, 3.8) | 0.677 |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | KOOS: ADL (0-100) | 4 mo | 100 | 84.2 (NR) | 98 | 85.7 (NR) | -0.8 (-4.7, 3) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | KOOS: Sport/rec (0-100) | 4 mo | 100 | 29.8 (NR) | 98 | 30.9 (NR) | -1.9 (-8.8, 5) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | WOMAC: Physical function (0-68) | 4 mo | 100 | 83.9 (NR) | 98 | 84.9 (NR) | -0.1 (-3.9, 3.7) | NR |
| Monticone, 2013, 23063624, Italy | Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: ADL (0-100) | 6 mo | 55 | NR | 55 | NR | 14.22 (8.35, 20.08) | NR |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: ADL (0-100) | 12 mo | 55 | NR | 55 | NR | 11.84 (6.79, 16.89) | NR |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Sport/rec (0-100) | 6 mo | 55 | NR | 55 | NR | 13.31 (5.81, 20.79) | NR |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: Sport/rec (0-100) | 12 mo | 55 | NR | 55 | NR | 10.69 (2.79, 18.62) | NR |
| Moutzouri, 2018, 29473481, Greece | Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | KOS: ADL (0-100) | 3.5 mo | 25 | 79.6 (9) | 26 | 60.6 (9.3) | **19.0 (15.4, 22.6)**B | **NR** |
| Piva, 2017, 28217891, USA | Comprehensive behavioral intervention | Standard of care exercise | Moderate | SF-36: Physical function (0-100) | 6 mo | 21 | 76.7 (16.1) | 20 | 70.3 (24.2) | 6.4 (-2.9, 15.7)B | NR |
| Comprehensive behavioral intervention | Standard of care exercise | Moderate | WOMAC: Physical function (0-68) | 6 mo | 21 | 11.8 (6.7) | 20 | 12.8 (10.8) | -1 (-5.1, 3.1)B |  |
| Piva, 2019, 30794296, USA | Clinic-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Performance (0-10) | 3 mo | 90 | 6.5 (1.7) | 44 | 5.4 (1.7) | 1.3 (0.7, 0.6 | NR |
| Clinic-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Performance (0-10) | 6 mo | 88 | 6.8 (1.9) | 45 | 6.0 (1.6) | 0.7 (0.1, 1.2) | NR |
| Clinic-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Satisfaction (0-10) | 3 mo | 90 | 6.6 (1.8) | 44 | 5.0 (2.0) | 0.7 (0.1, 1.4) | NR |
| Clinic-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Satisfaction (0-10) | 6 mo | 89 | 6.8 (2.1) | 45 | 5.7 (1.9) | 0.8 (0.1, 1.5) | NR |
| Community-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Performance (0-10) | 3 mo | 87 | 6.0 (1.8) | 44 | 5.4 (1.7) | 1.3 (0.7, 0.6 | NR |
| Community-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Performance (0-10) | 6 mo | 88 | 6.6 (1.9) | 45 | 6.0 (1.6) | 0.7 (0.1, 1.2) | NR |
| Community-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Satisfaction (0-10) | 3 mo | 87 | 57 (2.1) | 44 | 5.0 (2.0) | 0.7 (0.1, 1.4) | NR |
| Community-based group exercise | Standard care | Moderate | Canadian occupational performance measure: Satisfaction (0-10) | 6 mo | 88 | 6.5 (2.1) | 45 | 5.7 (1.9) | 0.8 (0.1, 1.5) | NR |
| Clinic-based group exercise | Standard care | Moderate | WOMAC: Physical function (0-68) | 3 mo | 90 | 10.1 (6.6) | 44 | 11.9 (7.6) | 0.1 (-2.7, 2.9) | NR |
| Clinic-based group exercise | Standard care | Moderate | WOMAC: Physical function (0-68) | 6 mo | 89 | 9.8 (7.2) | 45 | 11.8 (7.5) | -0.8 (-3.7, 2.0) | NR |
| Community-based group exercise | Standard care | Moderate | WOMAC: Physical function (0-68) | 3 mo | 87 | 12.2 (7.9) | 44 | 11.9 (7.6) | -2.1 (-4.9, 0.7) | NR |
| Community-based group exercise | Standard care | Moderate | WOMAC: Physical function (0-68) | 6 mo | 88 | 10.8 (7.9) | 45 | 11.8 (7.5) | -2.1 (-5.0, 0.7) | NR |
| Petersen, 2018, 29294078, Netherlands | Exercise & acupuncture | Exercise | High | KOOS: ADL (0-100) | 3 mo | 86 | N with success (%)  54 (63%) | 82 | N with success (%)  54 (63%) | **RR 0.95**  **(0.76 to**  **1.19)** | **0.679** |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | KOS: ADL | 3 mo | 92 | 0.81 (NR) | 78 | 0.80 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | KOS: ADL | 12 mo | 61 | 0.86 (NR) | 68 | 0.85 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | WOMAC: Physical function (0-68) | 3 mo | 92 | 44.64 (NR) | 78 | 44.45 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | WOMAC: Physical function (0-68) | 12 mo | 61 | 46.74 (NR) | 68 | 46.05 (NR) | NR | NR |
| Pua, 2017, 27810379, Singapore | Rehabilitation attendance (2 or more sessions) | Rehabilitation attendance: none | Moderate | SF-36: Physical function (0-100) | 6 mo | NR | 68 (20) | NR | 58 (28) | **5.1 (0.6, 9.6)** | **0.025** |
| Rehabilitation attendance (2 or more sessions) | Rehabilitation attendance: none | Moderate | SF-36: Physical function (0-100) | 6 mo | NR | 63 (22) | NR | 58 (28) | 3.5 (-2.4, 9.3) | 0.24 |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | KOOS: ADL (0-100) | 6.5 mo | 48 | 90 (11) | 48 | 88 (13) | 3 (-5, 11) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | LEFS | 6.5 mo | 48 | 53 (12) | 48 | 54 (12) | -2 (-7.0, 3.0) | NR |
| Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | SF-12: Physical component | 6.5 mo | 48 | 47 (8) | 48 | 46 (9) | 1 (-3, 5) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | SF-36: Physical function (0-100) | 12 mo | 53 | 23 (NR) | 55 | 27 (NR) | NR | NR |
| Home exercise | Control | Moderate | WOMAC: Physical function (0-68) | 12 mo | 53 | 44 (NR) | 55 | 40 (NR) | NR | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, ADL = activities of daily living, CI = confidence interval, EQ-5D = EuroQual, KOS = Knee outcome survey, KOOS = Knee injury and osteoarthritis outcome score, LEFS = Lower Extremity Functional Scale, mo = month, NR = not reported, PMID = PubMed identifier, rec = recreation, RR = relative risk, RoB = risk of bias, SD = standard deviation, SF-36 = 36-Item short form survey, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Calculated

C We included the sports and recreation component of the KOOS in the table of physical function as it was most related to other domains. Given it assesses function beyond activities of daily living though, it was not included in our assessment of the evidence of ADLs for the evidence profile

D This scale is patient-reported and distinct from the other performance-based measures, but relates to patient’s confidence about balance specifically and was therefore included here

E Defined as 14 weeks

**Transfers**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation | Supervised rehabilitation | High | Chair stand test (timed or number of repetitions unspecified) | 6 mo | NR | NR (NR) | NR | NR | <10%(MD) | ns |
| Technological assisted rehabilitation | Supervised rehabilitation | High | Chair stand test (timed or number of repetitions unspecified) | 12 mo | NR | NR (NR) | NR | NR | <10%(MD) | ns |
| Liao, 2015, 25552523, Taiwan | Functional plus balance rehabilitation | Functional rehabilitation | High | Chair stand test: Total sit-to-stands in 30s (n) | 32 w | 65 | 8.7 (1.7) | 65 | 7.7 (1.7) | **1 (0.6, 1.4)B** | **<0.001** |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training | Standard care | Moderate | Chair stand test: Total sit-to-stands in 30s (n) | 4 mo | 30 | 17.67 (2.92) | 30 | 14.60 (2.86) | **3.1 (2.0, 4.1)B** | **0.001** |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Chair stand test: Time to complete 5 sit-to-stands (s) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.2 |
| Group-based rehabilitation | Supervised home-exercises | High | Chair stand test: Time to complete 5 sit-to-stands (s) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.1 |
| Group-based rehabilitation | Supervised home-exercises | High | Chair stand test: Total sit-to-stands in 30s (n) | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.8 |
| Group-based rehabilitation | Supervised home-exercises | High | Chair stand test: Total sit-to-stands in 30s (n) | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.2 |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | Chair stand test: Total sit-to-stands in 30s (n) | 3 mo | 43 | Median (IQR) 7 (4) | 43 | Median (IQR) 7 (6) | Median difference 0.56 (0.44, -0.9) | 0.2 |
| Home-visit physiotherapy | Usual care | High | Chair stand test: Total sit-to-stands in 30s (n) | 6 mo | NR | NR | NR | NR | NR | NR |
| Home-visit physiotherapy | Usual care | High | Chair stand test: Total sit-to-stands in 30s (n) | 12 mo | 40 | Media (IQR) 7 (8) | 43 | Media (IQR) 8 (6) | Median difference -0.2 (-1.8, 1.5) | 0.85 |
| Piva, 2017, 28217891, USA | Comprehensive behavioral intervention | Standard of care exercise | Moderate | Chair stand test: Time to complete 5 sit-to-stands (s) | 6 mo | 21 | 12.2 (2.8) | 20 | 13.7 (7.5) | -1.5 (-4.4, 1.4)† | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation & hip strengthening exercises | Standard rehabilitation & general functional exercise | Moderate | Chair stand test: Total sit-to-stands in 30s (n) | 6.5 mo | 48 | 15 (4) | 48 | 15 (5) | 0 (-2, 1) | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, CST = chair stand test, IQR = interquartile range, MD = mean difference, mo = month, n = number, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, SE = standard error.

A Time from surgery

B Calculated

**Balance**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | Usual physiotherapy care | Moderate | Balance: Time stands (s) | 9 mo | 29 | 29 (7) | 28 | 32 (13) | Adj MD -2(-7, 3) | NR |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training | Standard care | Moderate | Balance: Forward reach test (cm) | 4 mo | 30 | 24.23 (6.99) | 30 | 18.34 (5.69) | **5.9 (3.6, 8.2)B** | **0.004** |
| Elastic resistance exercise training | Standard care | Moderate | Balance: Single-leg stance (s) | 4 mo | 30 | 18.84 (5.73) | 30 | 13.87 (7.58) | **5 (2.5, 7.4)B** | **0.004** |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Balance: Tandem testC | 3 mo | 36 | NR (NR) | 34 | NR (NR) | NR | 0.2 |
| Group-based rehabilitation | Supervised home-exercises | High | Balance: Tandem testC | 6 mo | 36 | NR (NR) | 32 | NR (NR) | NR | 0.5 |
| Piva, 2017, 28217891, USA | Comprehensive behavioral intervention | Standard of care exercise | Moderate | Balance: Single-leg stanceD | 6 mo | 21 | 16.1 (9.6) | 20 | 17.4 (9.8) | -1.3 (-5.5, 2.9)B | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | Balance: Step test | 6.5 mo | 48 | 17 (4) | 48 | 18 (5) | -1 (-3, 1) | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference, CI = confidence interval, cm = centimeter, mo = month, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, s = seconds, SD = standard deviation.

A Time from surgery

B Calculated

C 10 seconds each in side-by-side, semi-tandem and tandem stand

D Measures the time that participants balanced on 1 leg while keeping their hands on the waist

**Mobility**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation | Supervised rehabilitation | High | 10-m walk test (s) | 6 mo | NR | NR (NR) | NR | NR (NR) | <10%(MD) | ns |
| Technological assisted rehabilitation | Supervised rehabilitation | High | 10-m walk test (s) | 12 mo | NR | NR (NR) | NR | NR (NR) | <10%(MD) | ns |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 6MWT (m) | 3 mo | 77 | 493.7 (92.4) | 76 | 478.7 (82.7) | 15 (-4.7, 34.7)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 6MWT (m) | 6 mo | 71 | 520.3 (91.1) | 71 | 511.7 (77.7) | 8.6 (-11.2, 28.4)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 6MWT (m) | 12 mo | 69 | 531.7 (98.9) | 67 | 513.6 (78.4) | 18.1 (-3.3, 39.5)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Stair climb testC | 3 mo | 77 | 13.02 (4.62) | 76 | 13.60 (3.58) | -0.6 (-1.5, 0.4)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Stair climb testC | 6 mo | 71 | 11.78 (4.29) | 71 | 12.15 (3.3) | -0.4 (-1.3, 0.5)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Stair climb testC | 12 mo | 70 | 11.40 (3.62) | 67 | 11.77 (3.15) | -0.4 (-1.2, 0.4)B | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | Stair climb test (s)C | 3 mo | 26 | 12.8 (0.74) | 29 | 14.8 (1.03) | -2 (-2.3, -1.7)B | 0.29 |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | Usual physiotherapy group | Moderate | Figure eight test (steps) | 9 mo | 29 | 9 (11) | 28 | 12 (12) | Adj -4(-8, 1) | NR |
| Walking-skill group | Usual physiotherapy group | Moderate | 6MWT (m) | 9 mo | 29 | 492 (90) | 28 | 425 (93) | **Adj 44 (8, 80)** | **0.02** |
| Walking-skill group | Usual physiotherapy group | Moderate | Stair climb test (s)D | 9 mo | 29 | 14 (8) | 28 | 15 (7) | Adj 0(-4, 4) | NR |
| Fransen, 2017, 27868384, Australia | Outpatient exercise group | Usual care | Moderate | 50-foot walk speed (s) | 12 mo | 179 | 1.6 (0) | 169 | 1.6; SE (0) | NR | NR |
| Outpatient exercise group | Usual care | Moderate | Stair climb power (W)E | 12 mo | 179 | 278 (9) | 169 | 279; SE (9) | NR | NR |
| Heikkilä, 2017, 28119232, Finland | Home exercise | Control | High | Cadence: Maximal (Steps/min) | 14 mo | 53 | 141.4 (16.5) | 55 | 133.7 (14.9) | **7.7 (3.5, 11.9)B** | **NR** |
| Home exercise | Control | High | Cadence: Normal (Steps/min) | 14 mo | 53 | 120.9 (21.4) | 55 | 116.8 (11.2) | 4.1 (-0.9, 9.1)B | NR |
| Home exercise | Control | High | Walking velocity: Maximal (m/s) | 14 mo | 53 | 1.24 (0.37) | 55 | 1.18 (0.28) | 0.1 (-0.03, 0.2)B | NR |
| Home exercise | Control | High | Walking velocity: Normal (m/s) | 14 mo | 53 | 1.67 (0.40) | 55 | 1.52 (0.41) | **0.2 (0.04, 0.3)B** | **NR** |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation group | Control | Moderate | 15-m walk test (s) | 6 mo | 36 | 13.4 (2.4) | 39 | 13.3 (2.5) | 0.1 (-0.7, 0.9)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | 15-m walk test (s) | 12 mo | 36 | 13.8 (3.6) | 37 | 13.7 (2.9) | 0.1 (-1, 1.2)B | 0.3 |
| Multidisciplinary rehabilitation group | Control | Moderate | Stair climb test: Ascend (s) | 6 mo | 36 | 11 (5.6) | 36 | 9.6 (3.4) | 1.4 (-0.2, 3)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Stair climb test: Ascend (s) | 12 mo | 36 | 10.3 (3.7) | 34 | 10 (4.1) | 0.3 (-1, 1.6)B | 0.5 |
| Multidisciplinary rehabilitation group | Control | Moderate | Stair climb test: Descend (s) | 6 mo | 36 | 10.7 (5) | 36 | 10.5 (4.1) | 0.2 (-1.3, 1.7)B | NR |
| Multidisciplinary rehabilitation group | Control | Moderate | Stair climb test: Descend (s) | 12 mo | 36 | 10.7 (5.3) | 33 | 10.7 (5) | 0 (-1.7, 1.7)B | 0.2 |
| Li, 2019, 31003647, China | Tai chi exercise | Control | Moderate | 6MWT (m) | 3 moK | 54 | 467.1 (51.4) | 53 | 429.2 (47.5) | **37.9 (24.6, 51.2)B** | **0.01** |
| Liao, 2015, 25552523, Taiwan | Functional plus balance rehabilitation | Functional rehabilitation | High | Stair climb test (s)F | 32 w | 65 | 12.2 (1.8) | 65 | 14.5 (2.5) | **−2.5 (−3.2, −1.7)** | **<0.001** |
| Functional plus balance rehabilitation | Functional rehabilitation | High | Gait speed (m/sec) | 4 mo | 30 | 1.42 (0.28) | 30 | 1.25 (0.30) | **0.16 (0.07, 0.26)** | **<0.01** |
| Madsen, 2013, 23651717, Denmark | Group-based rehabilitation | Supervised home-exercises | High | Walking velocity (NR)G | 3 mo | 36 | 0.32 (0.21) | 34 | 0.3 (0.2) | NR | 0.7 |
| Group-based rehabilitation | Supervised home-exercises | High | Walking velocity (NR)G | 6 mo | 36 | 0.40 (0.22) | 32 | 0.36 (0.22) | NR | 0.5 |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | 10-m walk test (s) | 3 mo | 42 | Median 9.9 | 43 | Median 10.3 | Median difference -0.4 (-1.6, 1.3) | 0.55 |
| Home-visit physiotherapy | Usual care | High | 10-m walk test (s) | 12 mo | 40 | Median 9.2 | 43 | Median 9.1 | Median difference -0.2 (-1.5, 1.2) | 0.8 |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | 6MWT (m) | 4 mo | 100 | 396.3 (NR) | 98 | 407.5 (NR) | -7.4 (-27.8, 13.1) | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Stair climb test (s)F | 4 mo | 100 | 29.9 (NR) | 98 | 26.6 (NR) | -1.2 (-4.8, 2.4) | NR |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | 6MWT (m) | 3 mo | 76 | 530 (NR) | 92 | 535 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | 6MWT (m) | 12 mo | 68 | 545 (NR) | 81 | 554 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Stair climb test (s)F | 3 mo | 76 | 14.28 (NR) | 92 | 12.78 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | Stair climb test (s)F | 12 mo | 68 | 13.62 (NR) | 81 | 11.75 (NR) | NR | NR |
| Piva, 2017, 28217891, USA | Comprehensive behavioral intervention | Standard of care exercise | Moderate | 6MWT (m) | 6 mo | 21 | 472.6 (86.5) | 20 | 518 (103.3) | **-45.4 (-87.2, -3.6)B** | **NR** |
| Comprehensive behavioral intervention | Standard of care exercise | Moderate | Self-selected gait speed (m/s) | 6 mo | 21 | 1.14 (0.16) | 20 | 1.18 (0.24) | -0.04 (-0.1, 0.1)B | NR |
| Comprehensive behavioral intervention | Standard of care exercise | Moderate | Stair climb test (s)H | 6 mo | 21 | 14.3 (4.1) | 20 | 15.6 (7.4) | -1.3 (-4.1, 1.5)B | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation & hip strengthening exercises | Standard rehabilitation & general functional exercise | Moderate | 40m-fast-paced walk test (s) | 6.5 mo | 48 | 29 (9) | 48 | 29 (10) | 0 (-15, 16) | NR |
| Standard rehabilitation & hip strengthening exercises | Standard rehabilitation & general functional exercise | Moderate | 6MWT (m) | 6.5 mo | 48 | 474 (106) | 48 | 477 (128) | -3 (-36.5, 30.5)B | NR |
| Standard rehabilitation & hip strengthening exercises | Standard rehabilitation & general functional exercise | Moderate | Stair climb test (s)I | 6.5 mo | 48 | 7 (2) | 48 | 7 (2) | -2 (-5, 1) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | Maximal walking speed (m/s)J | 12 mo | 53 | 1.04 (NR) | 55 | 1.18 (NR) | NR | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results. If p-values were not significant, we did not bold our calculated confidence intervals, even if significant.

Abbreviations: 6MWT = six-minute walk test CI = confidence interval, MD = mean difference, mo = month, m = meter, NR = not reported, ns = not significant, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation, SE = standard error, W = watt.

A Time from surgery

B Calculated

C Defined as the total time to ascend and descend flight of 12 stairs

D Defined as the total time to ascend and descend a flight of 16 stairs

E Calculated from time to perform stair climb test, number of stairs, stair height, and body weight.

F Specifics of the stair climb test not defined

G Measured during a 10-m walk test. Unit not reported, likely m/s

H Defined as the total time to ascend and descend a flight of 11 stairs

I Defined as the time taken to ascend four steps in seconds

J Measured using GAITRite Walkway System (CIR Systems Inc., Sparta, USA). Participants were instructed to walk barefoot as rapidly as possible. The participants started walking from a point 2 meters in front of the mat and stopped at a point 2 meters beyond the mat

K Defined as 14 weeks

**Timed Up and Go**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation | Supervised rehabilitation | High | 6 mo | NR | NR | NR | NR | <10%(MD) | ns |
| Technological assisted rehabilitation | Supervised rehabilitation | High | 12 mo | NR | NR | NR | NR | <10%(MD) | ns |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 3 mo | 77 | 7.58 (1.82) | 76 | 7.98 (1.58) | -0.4 (-0.8, -0.01)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 6 mo | 71 | 7.33 (1.6) | 71 | 7.48 (1.45) | -0.2 (-0.5, 0.2)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | 12 mo | 71 | 7.36 (1.77) | 67 | 7.44 (1.50) | -0.1 (-0.5, 0.3)B | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | 3 mo | 26 | 7.3 (0.32) | 29 | 8.1 (0.41) | -0.8 (-0.9, -0.7)B | 0.29C |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | 3 mo | 30 | 12.3 (2.1) | 30 | 12.9 (1.9) | -0.6 (-1.3, 0.1)B | NR |
| Hamilton, 2020, 33051212,UK | Therapist led | Home-based exercises | Moderate | 3 moD | 143 | 14.65 (38.0) | 143 | 22.5 (77.2) | 4.64(-14.25,4.96) | 0.34 |
| Liao, 2020, 31687984, Taiwan | Elastic resistance exercise training | Standard care | Moderate | 4 mo | 30 | 9.13 (1.13) | 30 | 12.32 (2.71) | **-3.2 (-4.0, -2.3)**B | **0.002** |
| Moutzouri, 2018, 29473481, Greece | Early self-managed focal sensorimotor exercise training | Functional exercise training | Moderate | 3.5 mo | 25 | 8.1 (1.7) | 26 | 12.4 (2.5) | -4.3 (-5.2, -3.4)B | NR |
| Petterson, 2009, 19177542, USA | Exercise & NMES group | Exercise | High | 3 mo | 92 | 8.02 (NR) | 78 | 8.29 (NR) | NR | NR |
| Exercise & NMES group | Exercise | High | 12 mo | 61 | 7.68 (NR) | 68 | 8.07 (NR) | NR | NR |
| Schache, 2019, 31208916, Australia | Standard rehabilitation and hip strengthening exercises | Standard rehabilitation plus general functional exercise | Moderate | 6.5 mo | 48 | 8 (2) | 48 | 8 (3) | -2 (-6, 2) | NR |
| Vuorenmaa, 2014, 24241606, Finland | Home exercise | Control | Moderate | 12 mo | 53 | 9.18 (NR) | 55 | 10.33 (NR) | NR | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, MD = mean difference, mo = month, NMES = neuromuscular electrical stimulation, NR = not reported, ns = not significant, PMID = PubMed identifier, RoB = risk of bias, s = second, SD = standard deviation.

A Time from surgery

B Calculated

C Two-way repeated-measure analysis of variance adjusted for time and group was not significant

D Defined as 14 weeks

Other Patient-Reported Outcomes – Acute rehabilitation

**Quality of life**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rockstroh, 2010, 20533147, Germany | Physiotherapy & microcurrent | Physiotherapy | High | QoL (Oswestry score) | 3 mo | 37 | Median (IQR) 91 (81 ,91) | 41 | Median (IQR) 78 (57 ,87) | **-13 (-19.0, -7.02)B** | **<0.001** |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, IQR = interquartile range, mo = month, NR = not reported, PMID = PubMed identifier, QoL = quality of life, RoB = risk of bias, SD = standard deviation.

A Time from surgery

B Calculated

**Patient satisfaction with care**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | Patient satisfaction with care | NR | 81 | 91.9 (95 % CI 87.6, 96.1) | 84 | 82.9 (95 % CI 78.7, 87.2) | **8.9 (3.0,14.9)** | **NR** |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Patient satisfaction with care | 3 mo | 21 | 8.7 (1.6) | 22 | 9.4 (0.9) | -0.7 (-1.5, 0.15) | NR |
| Liebs, 2010, 20360503,  Germany | Ergometer cycling | Control | Moderate | Patient satisfaction with care | 24 mo | 66 | 53 (80%)B | 52 | 39 (75%) | RR: 1.359 (0.57-3.26) | 0.490 |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, KOOS = Knee injury and osteoarthritis outcome score, mo = month, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, RR = relative risk SD = standard deviation.

A Time from surgery

B Reported as number of patients responding (%) ‘very satisfied’ with results of TKA

**Patient global assessment**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | KOOS (0-100) | 6.5 mo | 79 | 75.7 (95 % CI 71.7, 79.9) | 80 | 73.7 (95 % CI 69.7, 77.7) | 1.99 (-3.68,7.67) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | KOOS (0-100) | 12 mo | 79 | 76.4 (95 % CI 72.4, 80.4) | 77 | 77 (95 % CI 73, 81) | -2.95 (-8.74, 2.84) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | EQ-5D index: 0-1 | 6.5 mo | 79 | 0.74 (95 % CI 0.70, 0.78) | 80 | 0.72 (95 % CI 0.68, 0.77) | -0.01 (-0.07, 0.05) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | EQ-5D index: 0-1 | 12 mo | 79 | 0.70 (95 % CI 0.66, 0.75) | 77 | 0.73 (95 % CI 0.69, 0.78) | 0.02 (-0.04, 0.08) | NR |
| Chan, 2018, 29372260, Singapore | Discharge to home | Discharge to community hospitals | Moderate | Knee Society Clinical Rating System: Knee domain (0-100) | 6 mo | 967 | 84.6 (95 % CI 83.8 , 85.4) | 98 | 82.2 (95 % CI 79.7, 84.7) | -2.4 (-5.1, 0.2) | 0.0712 |
| Discharge to home | Discharge to community hospitals | Moderate | Knee Society Clinical Rating System: Knee domain (0-100) | 24 mo | 801 | 85.1 (95 % CI 84.2 , 86.0) | 78 | 80.7 (95 % CI 77.9, 83.5) | **4.4 (1.4, 7.3)** | **0.0035** |
| den Hertog, 2012, 22643801, Germany | Fast-track rehabilitation | Standard care | Moderate | WOMAC index (0-10) | 3 mo | 74 | NR | 73 | NR | **NR** | **0.002** |
| Fast-track rehabilitation | Standard care | Moderate | Knee society score (0-100)B | 3 mo | 74 | NR | 73 | NR | **NR** | **0.0003** |
| Iwakiri,  2020,  32373475, Japan | ROM day 1 | ROM day 7 | High | WOMAC: Total (0-96)C | 3 mo | 55 | 19.1 (16.8) | 54 | 15.0 (10.3) | **-4.1 (-8.0, -0.2)** | 0.35 |
| ROM day 1 | ROM day 7 | High | WOMAC: Total (0-96)C | 1 y | 55 | 15.6 (16.3) | 54 | 13.4 (8.6) | **-2.2 (-5.9, 1.5)** | 0.56 |
| ROM day 1 | ROM day 7 | High | WOMAC: Total (0-96)C | 2 yrs | 55 | 13.3 (13.1) | 54 | 12.5 (12.7) | **-0.8 (-4.2, 2.6)** | 0.76 |
| Jin, 2018, CN-01617489, China | Virtual reality & usual care | Usual care | High | WOMAC: Total (0-96) | 3 mo | 33 | 25.79 (4.20) | 33 | 29.67 (5.55) | **-3.9 (-5.6, -2.2)D** | **0.002** |
| Virtual reality & usual care | Usual care | High | WOMAC: Total (0-96) | 6 mo | 33 | 21.58 (4.19) | 33 | 26.33 (3.85) | **-4.8 (-6.1, -3.4)D** | **0** |
| Lenssen, 2006, 16942627, Netherlands | Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | WOMAC: Total (0-96) | 3 mo | 21 | 73.4 (14.9) | 22 | 78.0 (11.3) | **-4.6 (-13 8, -3.9)** | **NR** |
| Physiotherapy [twice daily(40 mins/day)] | Physiotherapy [once daily(20 mins/day)] | Moderate | Knee society score (knee) | 3 mo | 21 | 80 (17) | 22 | 80 (18) | 0 (-11.3, 11.3) | NR |
| Liebs, 2012, 22196125,  Germany | Early Aquatic therapy | Late Aquatic therapy | Moderate | SF-6D | 24 mo | 66 | 0.721 (0.119) | 69 | 0.703 (0.135) | 0.14 (NR, NR) | 0.298 |
| Padgett, 2018, 29352683, USA | Inpatient rehabilitation | Discharge Home | Moderate | SF-12 (0-100) | 24 mo | 1213 | NR (NR) | 1213 | NR (NR) | NR | ns |
| Inpatient rehabilitation | Skilled nursing facility | Moderate | SF-12 (0-100) | 24 mo | 1213 | NR (NR) | 492 | NR (NR) | NR | ns |
| Sattler, 2019, 30994586, Australia | Pedaling-based protocol | Non-pedaling (multi-exercise) protocol | Moderate | EQ-5D (5-15) | 4 mo | 28 | Median (6.0) | 28 | Median (7.0) | NR | NR |
| Stevens Lapsley, 2012, 22095207, USA | Standard rehabilitation & NMES | Standard rehabilitation | Moderate | Global rating scale of perceived knee function (0-100) | 12 mo | 25 | 95.6 (5.7) | 30 | 87.3 (15) | **8.3 (2.5, 14.1)D** | **NR** |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, EQ-5D = EuroQual, KOOS = Knee injury and osteoarthritis outcome score, mo = month, NMES = neuromuscular electrical stimulation, NR = not reported, ns = not significant, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion, SD = standard deviation, ROM = range of motion, SF-12 = 12-item short form survey, SF-36 = 36-item short form survey, SF-6D = short-form six-dimension, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Scale combines assessment of function with pain, stability, range of motion, and muscle power and thus combines patient-reported with clinic-assessed outcomes

C Study did not report scale or interpretation for WOMAC total score. Low values are not consistent with the WOMAC score (0-96) where higher is better and may reflect the within-group change from baseline (which was also lower than expected: 38.3 [SD 20.9] for ROM Day 1 group vs. 43.7 [SD 16.1] for ROM Day 7 group).

D Calculated

Other Patient-Reported Outcomes – Post-acute rehabilitation

**Quality of life**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Andersen, 2018, CN-01647420, Denmark | Technological assisted rehabilitation | Supervised rehabilitation | High | KOOS: QoL (0-100) | 6 mo | NR | NR (NR) | NR | NR (NR) | **12.2% (in favor of technological assisted rehabilitation)** | **NR** |
| Technological assisted rehabilitation | Supervised rehabilitation | High | KOOS: QoL (0-100) | 12 mo | NR | NR (NR) | NR | NR (NR) | **<10% difference between groups** | **NR** |
| Artz, 2017, 27068368,UK | Group-based exercise | Usual care | High | KOOS: QoL (0-100) | 3 mo | 19 | 52.4 (27.1) | 12 | 36.1 (17.3) | 16.3 (5.1, 27.5)B | NR |
| Group-based exercise | Usual care | High | KOOS: QoL (0-100) | 6 mo | 21 | 61.5 (32.3) | 15 | 45.1 (29.2) | 16.4 (2.1, 30.7)B | NR |
| Bruun-Olsen, 2013, 23614370, Norway | Walking-skill group | 17 individual physiotherapy sessions | Moderate | KOOS: QoL (0-100) | 9 mo | 29 | 72 (24) | 28 | 62 (26) | adj 5 (-7, 17) | NR |
| DeJong,  2020,  32360105  USA | Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: QoL (0-100) | 6 mo | 70 | 77.1 (22.0) | 78 | 73.2 (22.9) | -3.9 (-9.0, 1.2) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: QoL (0-100) | 6 mo | 70 | 77.1 (22.0) | 76 | 76.1 (24.3) | 1.0 (-6.3, 4.3) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: QoL (0-100) | 6 mo | 70 | 77.1 (22.0) | 74 | 77.9 (21.6) | 0.8 (-4.2, 5.8) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | SF-36 (0-100) | 3 mo | 30 | 68 (11.6) | 30 | 67.8 (15.6) | 0.2 (-4.8, 5.2)B | NR |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation group | Control | Moderate | HRQoL-15D score | 1y | 36 | NR (NR) | 39 | NR (NR) | NR | >0.05 |
| Lenguerrand, 2020, 31033232, UK | Physical therapy and standard care | Standard care | Moderate | KOOS: QoL (0-100) | 12 mo | 72 | Median (IQR) 75 (50 , 94) | 69 | Median (IQR) 63 (56 , 88) | NR | 0.264 |
| Minns Lowe, 2012, 22180446, UK | Home-visit physiotherapy | Usual care | High | KOOS: QoL (0-100) | 3 mo | 46 | Median (IQR) 53.1 (25) | 47 | Media (IQR) 56.3 (31) | 3.2 (-2.8, 9.2)B | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: QoL (0-100) | 6 mo | 42 | Median (IQR) 59.4 (31) | 43 | Media (IQR) 59.4 (41) | 0 (-8.1, 8.1)B | NR |
| Home-visit physiotherapy | Usual care | High | KOOS: QoL (0-100) | 12 mo | 44 | Median (IQR) 63 (43) | 48 | Media (IQR) 62.5 (42) | -0.5 (-9.6, 8.6) | NR |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | KOOS: QoL (0-100) | 4 mo | 100 | 69 (NR) | 98 | 69.5 (NR) | -0.4 (-6.8, 6.1) | NR |
| Monticone, 2013, 23063624, Italy | Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: QoL (0-100) | 6 mo | 55 | NR | 55 | NR | **10.81 (3.01, 18.61)** | **NR** |
| Home-based functional exercises and kinesiophobia training | Usual care | Moderate | KOOS: QoL (0-100) | 12 mo | 55 | NR | 55 | NR | **12.27 (4.80, 19.74)** | **NR** |
| Petersen, 2018, 29294078, Netherlands | Exercise & acupuncture | Exercise | Moderate | KOOS: QoL (0-100) | 3 mo | 82 | N with success (%) 33 (39) | 83 | N with success (%) 31 (37) | RR 1.05 (0.72, 1.55) | 0.797 |
| Piva, 2019, 30794296, USA | Community-based group exercise | Standard care | Moderate | SF-36 (0-100) | 3 mo | 90 | 45 (9) | 44 | 44 (8) | 0.7 (-1.8, 3.2) | NR |
| Clinic-based group exercise | Standard care | Moderate | SF-36 (0-100) | 3 mo | 87 | 45 (8) | 44 | 44 (8) | 2.3 (-0.2, 4.7) | NR |
| Community-based group exercise | Standard care | Moderate | SF-36 (0-100) | 6 mo | 89 | 46 (9) | 45 | 44 (10) | 0.9 (-2.0, 3.7) | NR |
| Clinic-based group exercise | Standard care | Moderate | SF-36 (0-100) | 6 mo | 88 | 45 (9) | 45 | 44 (10) | 3.4 (0.5, 6.2) | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, HRQoL-15D = 15-dimensional instrument of health-related quality of life, IQR = interquartile range, KOOS = Knee injury and osteoarthritis outcome score, mo = month, NR = not reported, PMID = PubMed identifier, QoL = quality of life, RoB = risk of bias, SF-36 = 36-item short form survey, SD = standard deviation.

A Time from surgery

B Calculated

**Satisfaction with care**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | Health care satisfaction questionnaire | 4 mo | 98 | 90.3 (9.9) | 82 | 89.3 (9.6) | -1.0 (-3.02, 1.02)B | 0.34 |

Abbreviations: CI = confidence interval, mo = month, PMID = PubMed identifier, RoB = risk of bias, SD = standard deviation.

A Time from surgery

B Calculated

**Patient global assessment**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Artz, 2017, 27068368,UK | Group-based exercise | Usual care | High | Measure yourself medical outcome profile | 3 mo | 19 | 1.9 (1.3) | 12 | 2.8 (0.9) | **-0.9 (-1.5, -0.3)**B | **NR** |
| Group-based exercise | Usual care | High | Measure yourself medical outcome profile | 6 mo | 21 | 1.9 (1.4) | 15 | 2.4 (1.3) | -0.5 (-1.1, 0.1)B | NR |
| Bade, 2017, 27813347, USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | WOMAC: Total (0-96) | 3 mo | 72 | 14.49 (8.98) | 75 | 14.55 (8.38) | -0.1 (-2.1, 1.9)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | WOMAC: Total (0-96) | 6 mo | 66 | 8.97 (7.27) | 67 | 10.60 (9.45) | -1.6 (-3.7, 0.4)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | WOMAC: Total (0-96) | 12 mo | 62 | 6.69 (7.75) | 62 | 7.16 (6.28) | -0.5 (-2.2, 1.3)B | NR |
| Bily, 2016, 26763947, Austria | Leg-press group | Physiotherapy group | High | WOMAC: Total (0-96) | 3 mo | 26 | 2.3 (0.28) | 29 | 2.0 (0.18) | 0.3 (0.2, 0.4)B | 0.26 |
| DeJong,  2020,  32360105  USA | Body Weight-Adjustable Treadmill & PENS | Recumbent Bike & PENS | High | KOOS: Total (0-100) | 6 mo | 70 | 78.4 (17.8) | 78 | 75.4 (17.7) | -3.0 (-7.1, 1.1) | NR |
| Body Weight-Adjustable Treadmill & PENS | Body Weight-Adjustable Treadmill | High | KOOS: Total (0-100) | 6 mo | 70 | 78.4 (17.8) | 76 | 77.5 (18.3) | -0.9 (-5.0, 3.2) | NR |
| Body Weight-Adjustable Treadmill & PENS | Recumbent Bike/Usual Care | High | KOOS: Total (0-100) | 6 mo | 70 | 78.4 (17.8) | 74 | 80.7 (13.2) | 2.3 (-1.4, 6.0) | NR |
| Demircioglu, 2015, 26355656, Turkey | NMES & exercise | Exercise | High | WOMAC: Total (0-96) | 3 mo | 30 | 42.3 (11.3) | 30 | 47.2 (13.8) | **-4.9 (-9.5, -0.3)B** | **NR** |
| Kauppila, 2010, 20354057, Finland | Multidisciplinary rehabilitation group | Control | Moderate | WOMAC: Total (0-96) | 12 mo | 36 | NR (NR) | 39 | NR (NR) | NR | NR |
| Mitchell, 2005, 15869558, UK | Hospital | Home | High | SF-6D (0.3-1.0) | 3 mo | 57 | 0.56 (0.12) | 57 | 0.57 (0.09) | Adj MD 0.002 (-0.034, 0.039) | 0.894 |
| Hospital | Home | High | SF-36 (0-100) | 3 mo | 57 | 61.0 (22.9) | 57 | 61.0 (23.4) | Adj MD -0.2 (-7.0, 6.7) | 0.964 |
| Piva, 2019, 30794296, USA | Community-based group exercise | Standard care | Moderate | PROMIS | 3 mo | 90 | 45 (5) | 44 | 45 (5) | 0.5 (-1.0, 1.9) | NR |
| Community-based group exercise | Standard care | Moderate | PROMIS | 6 mo | 89 | 45 (5) | 45 | 44 (5) | 1.4 (-0.1, 2.9) | NR |
| Clinic-based group exercise | Standard care | Moderate | PROMIS | 3 mo | 87 | 45 (5) | 44 | 45 (5) | 1.0 (-0.4, 2.5) | NR |
| Clinic-based group exercise | Standard care | Moderate | PROMIS | 6 mo | 88 | 45 (5) | 45 | 44 (5) | 2.1 (0.7, 3.6) | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: Adj MD = adjusted mean difference CI = confidence interval, KOOS = Knee injury and osteoarthritis outcome score, mo = month, NMES = neuromuscular electrical stimulation, NR = not reported, PENS = patterned electrical neuromuscular stimulation, PMID = PubMed identifier, PROMIS = patient-reported outcomes measurement information system, RoB = risk of bias, SD = standard deviation, SF-36 = 36-Item short form survey, SF-6D = short-form six-dimension, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

A Time from surgery

B Calculated

Healthcare Utilization Outcomes – Acute rehabilitation

**Need for postoperative procedures**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **N Events Arm 2 (%)** | **N Arm 2** | **N Events Arm 2 (%)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | MUA | 12 mo | 79 | 4 (5%) | 77 | 3 (4%) | 1.30 (0.30, 5.62)B | NR |
| Harmer, 2009, 19177536, Australia | Water-based rehabilitation | Land-based rehabilitation | Moderate | MUA | 6 mo | 53 | 2 (4%) | 49 | 2 (4%) | 0.92 (0.14, 6.31)B | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, MUA = manipulation under anesthesia, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion.

A Time from surgery

B Calculated

**Other healthcare utilization outcomes**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **N Arm 1** | **Arm 1, Mean (SD)** | **N Arm 2** | **Arm 2, Mean (SD)** | **Effect Size (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Buhagiar, 2017, 28291891, Australia | Hospital Inpatient Rehabilitation | Home Program | Moderate | Time lost from work (time to return to work) (week) | NA | 81 | 7.57 (95 % CI 4.86, 10.25) | 84 | 7.80 (95 % CI 5.54, 10.06) | -0.23(-3.76, 3.30) | NR |
| Hospital Inpatient Rehabilitation | Home Program | Moderate | Outpatient physical therapy sessions | NA | 81 | 3.02 (95 % CI 2.75, 3.3) | 84 | 3.07 (95 % CI 2.81, 3.34) | -0.05(-0.43, 0.33) | NR |
| Liebs, 2010, 20360503,  Germany | Ergometer cycling | Control | Moderate | Admitted to hospital for limited range of motion | 24 mo | 66 | 1 (2%) | 52 | 0 (0) | 1.88 (0.06, 55.02)B | NR |
| Liebs, 2012, 22196125, Germany | Early Aquatic therapy | Late Aquatic therapy | Moderate | Readmitted to hospital for limited range of motion | 3 mo | 21 | 2 (10%) | 22 | 1 (5%) | 2.10 (0.20, 21.42)B | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, NA = not applicable, NR = not reported, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion.

A Time from surgery

B Calculated

Healthcare Utilization Outcomes – Post-acute rehabilitation

**Need for postoperative procedures**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **Arm 1 n/N (%)** | **Arm 2 n/N (%)** | **OR (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bade,  2017,  27813347,  USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Knee manipulation | 12 mo | 3/84 | 1/78 | 2.85 (0.29, 28.01)A | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, NR = not reported, OR = odds ratio, PMID = PubMed identifier, RoB = risk of bias.

A Calculated

Harms From Rehabilitation

**Harms**

| **Study, Year, PMID, Country** | **Arm 1** | **Arm 2** | **Overall RoB** | **Outcome Measurement** | **Time PointA** | **Arm 1 n/N (%)** | **Arm 2 n/N (%)** | **OR (95% CI)** | **Reported p-Value** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bade,  2017,  27813347,  USA | High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Musculoskeletal injuries | 12 mo | 0/84 (0%) | 1/78 (1%) | 0.46 (0.02, 13.94)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Restricted knee ROM | 12 mo | 3/84 (4%) | 3/78 (4%) | 0.93 (0.18, 4.73)B | NR |
| High-intensity progressive rehabilitation | Low-intensity rehabilitation | Moderate | Fall | 12 mo | 1/84 (1%) | 3/78 (4%) | 0.30 (0.03, 2.96)B | NR |
| Li, 2019,  31003647, China | Tai Chi | Control | Moderate | Fall | 3 mo | 0/54 (0%) | 3/53 (6%) | 0.16 (0.01, 3.19)B | NR |
| Moffet, 2015, 26178888, Canada | In-home Telerehabilitation | Standard home rehabilitation | Moderate | Fall | 4 mo | 1/101 (1%) | 0/104 (0%) | 2.06 (0.07, 60.71)B | NR |
| In-home Telerehabilitation | Standard home rehabilitation | Moderate | Wound bleeding (during flexion exercises) | 4 mo | 1/101 (1%) | 0/104 (0%) | 2.06 (0.07, 60.71)B | NR |
| Piva,  2019,  30794296,  USA | Community-based group exercise | Standard care | Moderate | Arthralgia | 4 mo | 7/96 (1%) | 1/48 (1%) | 3.70 (0.44, 30.95)B | NR |
| Community-based group exercise | Standard care | Moderate | Back Pain | 4 mo | 2/96 (2%) | 0/48 (0%) | 2.02 (0.09, 45.71)B | NR |
| Community-based group exercise | Standard care | Moderate | Fall | 4 mo | 1/96 (1%) | 1/48 (2%) | 0.49 (0.03, 8.09)B | NR |
| Community-based group exercise | Standard care | Moderate | Myalgia | 4 mo | 1/96 (1%) | 0/48 (0%) | 1.00 (0.03, 30.35)B | NR |
| Community-based group exercise | Standard care | Moderate | Other musculoskeletal and connective tissue | 4 mo | 0/96 (0%) | 0/48 (0%) | 0.50 (0.01, 25.46)B | NR |
| Clinic based | Standard care | Moderate | Arthralgia/joint pain | 4 mo | 12/96 (13%) | 1/48 (2%) | 6.71 (0.85, 53.26)B | NR |
| Clinic based | Standard care | Moderate | Back Pain | 4 mo | 1/96 (1%) | 0/48 (0%) | 1.00 (0.03, 30.35)B | NR |
| Clinic based | Standard care | Moderate | Injury related to arthroplasty-Fall | 4 mo | 0/96 (0%) | 1/48 (2%) | 0.25 (0.01, 7.47)B | NR |
| Clinic based | Standard care | Moderate | Myalgia | 4 mo | 0/96 (0%) | 0/48 (0%) | 0.50 (0.01, 25.46)B | NR |
| Clinic based | Standard care | Moderate | Other musculoskeletal and connective tissue | 4 mo | 5/96 (5%) | 0/48 (0%) | 5.22 (0.28, 97.58)B | NR |

Statistically significant effect sizes are in bold text. In cases where calculated effect size confidence intervals were not-statistically significant but reported p-values were, we deferred to reported p-values and still bolded results.

Abbreviations: CI = confidence interval, mo = month, NR = not reported, OR = odds ratio, PMID = PubMed identifier, RoB = risk of bias, ROM = range of motion.

A Time from surgery

B Calculated

1. Time point cutoffs for outcomes were informed through stakeholder feedback which resonated with literature noting a lag in recovery immediately after TKA/THA. Specifically, for postoperative outcomes (for both prehabilitation and rehabilitation), stakeholders agreed that short-term outcomes (less than 3 months for TKA and 6 months for THA) were too early to see functional- and patient-reported improvements and suggested that these outcomes are likely to be influenced by other patient and surgical factors, in additional to any (p)rehabilitation received. The exception was short term post-operative healthcare utilization outcomes following prehabilitation (e.g., length of stay, discharge disposition). [↑](#footnote-ref-1)