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PA Portfolio II – Summer 2023

Mini-CAT

**Clinical Scenario:**

60 y/o F with PMHx of HTN, DM2, HLD, and Osteoarthritis presents to the clinic complaining of chronic bilateral hip pain for three years that is affecting her day to day. After trying physical therapy with no improvement, she wants to get a hip-replacement. Patient wants to know if pre-rehabilitation prior to surgery can help speed up her recovery.

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**Search Question:**

Does preoperative exercise (pre-rehabilitation) have a positive effect in helping patients return to baseline in terms of strength and walking ability after total hip replacement when compared to no intervention?

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**PICO Table:**

| Population                | Intervention                      | Comparison                   | Outcome(s)                        |
|---------------------------|-----------------------------------|------------------------------|-----------------------------------|
| Total hip replacement     | Prehabilitation exercise          | No preoperative exercise     | postoperative functional outcomes |
| hip arthroplasty          | Preoperative Physical Activity    | No preoperative intervention | Regain strength earlier           |
| Bilateral hip replacement | Preoperative muscle strengthening | No Prehabilitation           |                                   |
|                           | Preoperative Aerobic exercise     | No preoperative exercise     |                                   |
|                           | Prehabilitation exercise          |                              |                                   |

## **Search Strategy and Databases Used:**

The best evidence when conducting research comes down to meta-analysis, and systemic review. If there aren't sufficient articles from meta-analysis studies or systemic review, I will use RCT, this is because well conducted studies tend to have a large sample size and can compare treatment to alternative treatment, and placebos and draw a conclusion to see if a treatment is effective, harmful or has no use. If I'm not able to find Meta-analysis studies, systemic reviews or RCT studies I will search for cohort studies to see how patients fared over time when receiving prehabilitation .

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## **Results found:**

All filters included meta-analysis, systematic review, Retrospective Cohort study and RCT, published in the last 10 years.

### **PubMed:**

Preoperative Aerobic exercise for hip replacement → 296 results → Filter by RCT, Systemic Review, Clinical Trial, and Meta-analysis -  
→ 91 Results → Filter by last 10 years -→ 63 results

Preoperative exercise and hip arthroplasty and benefits → 21 results → Filter by RCT, Systemic Review, Clinical Trial, and Meta-  
analysis -→ 12 Results → Filter by last 10 years -→ 9 results

Preoperative muscle strengthening and hip arthroplasty → 8 results → Filter by RCT, Systemic Review, Clinical Trial, and Meta-analysis  
→ 87 results → filter by 10 years → 1 results

Muscle strengthening and hip arthroplasty and recovery → 15 results Filter by RCT, Systemic Review, Clinical Trial, and Meta-analysis  
→ 5 results → filter by 10 years → 3 result

### **Google Scholar.**

Preoperative exercise for hip replacement and recovery-→34,500 Results → Since 2019 →17,500 -→ Review Articles -→ 16,800  
results.

Effect of Prehabilitation for hip replacement → 2,950 Results → Since 2019 → 1,610 → Review Articles → 16,800 results.

**Cochrane Search-database:**

Prehabilitation for hip replacement → Cochrane Review → 0 Result

Preoperative exercise for hip arthroplasty → Cochrane Review → 0 Result

Preoperative exercise and surgery → Cochrane Review → 10 Result

**Explanation:** When it came to choosing articles to research my topic on, I looked for studies done in the United States, and I used PubMed, Google scholar, and Cochrane. PubMed, and Google Scholar yielded me the most results for my PICO questions, and from there I narrowed down my search to articles completed within the last 10 years. I looked for mainly systemic-review, and meta-analysis articles that looked at patients who had some sort of prehabilitation or exercising training before getting a hip replacement and how the patient felt and improved after hip replacement.

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**Title:** The Influence of Preoperative Physical Activity on Postoperative Outcomes of Knee and Hip Arthroplasty Surgery in the Elderly: A Systematic Review

**Type of study:** Systemic Review

**Citation:** Vasta S, Papalia R, Torre G, Vorini F, Papalia G, Zampogna B, Fossati C, Bravi M, Campi S, Denaro V. The Influence of Preoperative Physical Activity on Postoperative Outcomes of Knee and Hip Arthroplasty Surgery in the Elderly: A Systematic Review. J Clin Med. 2020 Mar 31;9(4):969. doi: 10.3390/jcm9040969. PMID: 32244426; PMCID: PMC7231073.

**Hyperlink:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7231073/>

**Abstract:** In recent years there has been growing interest in the possibility to prepare patients for surgery through a “prehabilitation” program, composed of strengthening and stretching exercises in the immediate preoperative period

**Materials and Methods:** The authors looked at RCT, prospective cohort studies, case-control studies, and case series. The authors used PubMed-Medline, Cochrane Central and Google Scholar. The search was carried out between March and November 2019. 1855 articles were retrieved. 14 were finally included. Of the included studies, 12 were RCT of Level Of Evidence (LOE) I, 1 was a prospective case-control study of LOA II, and 1 was a CS of LOE IV. The included studies reported data on a total of 1175 patients, with an average age ranging from 66 to 76.9 year

**Results.** In one trial no difference occurred between study and control groups. In the other two papers reported better functional outcomes in the intervention group. Specifically, the time up and go (TUG) test and 6-minute walking test (6MWT) were better

performed at 6 weeks after surgery by those patients managed with preoperative program of strengthening. In another paper no difference was observed in length of stay, with an average time of 6 days in the study group (range 5–22 days) and of 6 days in the control group (range 4–7 days), with a  $p = 0.228$

**Conclusion:** It is not clear if specific exercise programs improve surgical outcomes and postoperative parameters of the patient, including the length of stay in the hospital and the quality of life.

**Key points:**

- In the study group at 12 and 24 weeks, and a greater stride length and increased gait speed were observed at 3, 12 and 24 weeks after surgery in those patients treated with a personalized activity program
- Slight modification of the exercise program did not yield significant differences in results, in fact in the trial by VanLeeuwen et al. No difference occurred between groups where progressive strength training was added to standard muscle strengthening

**Why I chose it:** I chose this article because it was a systemic review, that included RCT, prospective cohort studies, case-and control studies. Also, the researchers looked at gait speed improvement at three different intervals, which made this article more compelling for me to read up on,

**Title:** Effect of Prehabilitation in Form of Exercise and/or Education in Patients Undergoing Total Hip Arthroplasty on Postoperative Outcomes—A Systematic Review

**Type of study:** Systemic Review

**Citation:** Widmer P, Oesch P, Bachmann S. Effect of Prehabilitation in Form of Exercise and/or Education in Patients Undergoing Total Hip Arthroplasty on Postoperative Outcomes-A Systematic Review. *Medicina (Kaunas)*. 2022 May 30;58(6):742. doi: 10.3390/medicina58060742. PMID: 35744005; PMCID: PMC9228426.

**Hyperlink:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9228426/>

**Abstract:** Aim of this systematic review was to determine whether prehabilitation before total hip arthroplasty, in the form of exercise therapy, education alone, or both together, improves postoperative outcomes, such as physical functioning, compared with no intervention.

**Materials and Methods:** The authors searched for adult patients with hip osteoarthritis and with the research question of how preoperative intervention (exercise, education) compared with no intervention prior to total hip replacement implantation affects postoperative status. Strength training, walking with assistive devices such as crutches, functional activities, mobility, and cardiovascular training were considered exercise interventions. The search strategy described above identified 400 potentially relevant studies. Based on title and abstract, 332 studies were determined to be irrelevant. A further 54 articles were excluded after full text screening. A final total of 14 studies were included in the systematic review.

**Results:** 13 trials provided results on physical functioning, with six showing significant improvements. The authors found an improvement in hip flexion ROM, WOMAC, 6MWT, hip muscle strength, and gait velocity. A significant improvement in the 36-item Short Form Survey (SF-36) vitality subscore without reporting exact numbers. They reported a significant interaction effect between group and follow-up time point regarding vitality and mental health in favor of the intervention group one year after surgery

**Conclusion:** In summary, prehabilitation in the form of exercise was an effective prehabilitation measure with regard to postoperative physical functioning concerning actively conducted assessments like chair rise test, gait speed or stair climbing

**Key points:**

- prehabilitation had an impact on the need for postoperative physiotherapy and occupational therapy. They found that the intervention group needed significantly less physiotherapy and occupational therapy (physiotherapy 7.3 vs. 9.4 sessions and occupational therapy 2.2 vs. 3.1 sessions). In addition, the absolute therapy time required was less (physiotherapy 163.8 vs. 228.2 min and occupational therapy 55.6 vs. 75.8 min).
- the impact of prehabilitation on quality of life had significant improvement.
- Ten RCT examined how reported postoperative pain differed between the two groups and found found a trend towards a lower pain level (2.1 vs. 3.1 in the VAS or 9.3 vs. 10.6 in the WOMAC pain score).

**Why I chose it:** I chose this article because it's a systemic review that reviewed mainly RCT. What I liked about this article was that it looked at specific type of prehabilitation programs such as Strength training, walking with assistive devices such as crutches, functional activities, mobility, and cardiovascular training. Additionally, the authors not only looked at post-operative physical function, but also how prehabilitation therapy can affect pain, mental health, and quality of life.

**Title:** Effects of progressive resistance training prior to total HIP arthroplasty – a secondary analysis of a randomized controlled trial

**Type of study:** Review

**Citation:** A. Holsgaard-Larsen, A. Hermann, B. Zerahn, S. Mejdahl, S. Overgaard, Effects of progressive resistance training prior to total HIP arthroplasty – a secondary analysis of a randomized controlled trial, Osteoarthritis and Cartilage, Volume 28, Issue 8, 2020, Pages 1038-1045, ISSN 1063-4584, <https://doi.org/10.1016/j.joca.2020.04.010>.

**Hyperlink:** <https://www.sciencedirect.com/science/article/pii/S1063458420309882>

**Abstract:** To investigate the efficacy and feasibility of progressive explosive-type resistance training (RT) in patients with osteoarthritis (OA) of the hip scheduled for total hip arthroplasty (THA).

**Materials and Methods:** 3–12 months follow-up of a randomized controlled (balanced 1:1) Randomized controlled trial (1:1) in patients diagnosed with hip OA and scheduled for THA. The intervention group (IG) performed supervised preoperative progressive explosive-type RT twice a week for 10 weeks; four exercises (hip/thigh) performed in three series each (8–12 repetition maximum). The control group (CG) received ‘care as usual’. Eligible participants were: patients ( $\geq 50$  years) diagnosed with primary hip OA

**Results:** Data from 85% of study participation were available at 12 months. No superior effects were observed at 12 months for HOOS ADL (between-group change score [95%CI]) (2.6 [-4.2; 9.8],  $P = 0.44$ ) or remaining subscales. However, ascending (1.3 s [0.3; 2.3],  $P = 0.01$ ) and descending stairs (1.6 s [0.3; 2.9],  $P = 0.01$ ) demonstrated additional effects. A

**Conclusion:** At 12 months after surgery, there was no additional overall effect of 10 weeks preoperative progressive RT program compared with THA alone

**Key points:**

- Therapy group compared to control group improved muscle strength (knee extension of the affected side)
- The study could not confirm the hypothesis, that preoperative intervention program with progressive explosive-type RT of medium to high intensity for a duration of 10 weeks with two weekly training sessions was superior in improving postoperative physical function as well as muscle strength compared with THA alone.
- At 3 months there was a superior effect on quadriceps muscle function, which is otherwise known to be reduced in THA patients

**Why I chose it:** I chose this article because it's a review of an RCT to see how patients are performing after hip arthroplasty. It helped address my question about mobility and used recently collected data

**Title:** Prehabilitation for Patients Undergoing Orthopedic Surgery A Systematic Review and Meta-analysis

**Type of study:** Systemic Review & Meta analysis

**Citation:** Punnoose A, Claydon-Mueller LS, Weiss O, Zhang J, Rushton A, Khanduja V. Prehabilitation for Patients Undergoing Orthopedic Surgery: A Systematic Review and Meta-analysis. *JAMA Netw Open.* 2023;6(4):e238050. doi:10.1001/jamanetworkopen.2023.8050

**Hyperlink:** <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2803788>

**Abstract:** Prehabilitation programs for patients undergoing orthopedic surgery have been gaining popularity in recent years. To evaluate whether prehabilitation is associated with improved preoperative and postoperative outcomes compared with usual care for patients undergoing orthopedic surgery.

**Materials and Methods:** The authors searched Embase, Cochrane, and Published trials. Data were pooled using a random-effects model. Recommendations were determined using the Grading of Recommendations Assessment, Development and Evaluation system and the study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guideline. Forty-eight unique trials involving 3570 unique participants (2196 women [61.5%]; mean [SD] age, 64.1 [9.1] years) were analyzed

**Results** Preoperatively, moderate-certainty evidence favoring prehabilitation was reported for patients undergoing total knee replacement (TKR) for function (standardized mean difference [SMD], -0.70 [95% CI, -1.08 to -0.32]) and muscle strength and flexion (SMD, 1.00 [95% CI, 0.23-1.77]) and for patients undergoing total hip replacement (THR) for HRQOL on the 36-item Short Form Health Survey (weighted mean difference [WMD], 7.35 [95% CI, 3.15-11.54]) and muscle strength and abduction (SMD, 1.03 [95% CI, 0.03-2.02])

**Conclusion:** In this systematic review and meta-analysis of RCTs, moderate certainty evidence supported prehabilitation over usual care in improving preoperative function and strength as well as health-related quality of life for THR.



**Key points:**

- Reduction in preoperative pain following prehabilitation was statistically significant for THR
- Improvements in muscle strength were also reported to be statistically significant for hip abductors in patients undergoing THR
- there is moderate-certainty evidence for function, knee flexor strength, and 6-minute walk test performance for TKR, abduction strength for THR, and HRQOL

**Why I chose it:** I chose this article because it's a systemic review. I also found this article to be interesting because it was looking at other orthopedic surgeries such total knee replacement and how rehabilitation can be beneficial for patients undergoing Total hip replacement, lumbar surgery, and total knee replacement.

**Title:** Evaluation of Exercise Interventions and Outcomes After Hip ArthroplastyA Systematic Review and Meta-analysis

**Type of study:** Systemic Review and Meta-analysis

**Citation:** Saueressig T, Owen PJ, Zebisch J, Herbst M, Belavy DL. Evaluation of Exercise Interventions and Outcomes After Hip Arthroplasty: A Systematic Review and Meta-analysis. *JAMA Netw Open*. 2021;4(2):e210254. doi:10.1001/jamanetworkopen.2021.0254

**Hyperlink:** <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2776913>

**Abstract:** Preoperative and postoperative exercise interventions are commonly used in patients with total hip arthroplasty despite a lack of established efficacy. To explore clinical outcomes associated with exercise training before and after hip arthroplasty.

**Materials and Methods:** PubMed, Cochrane Central Register of Controlled Trials, Cumulative Index to Nursing and Allied Health Literature, EMBASE, and Google Scholar were searched from their inception to March 2020. Reference lists of included trials and related reviews were also searched. The primary prespecified outcome was self-reported physical function. Secondary prespecified outcomes were self-reported pain intensity, quality of life, gait speed, lower body muscle strength, lower body flexibility, anxiety, hospital length of stay, and adverse events. A total of 32 randomized clinical trials with 1753 patients were included in the qualitative synthesis, and 26 studies with 1004 patients were included in the meta-analysis.

**Results:** There was no significant effect size in favor of the usual care or no or minimal control group (4 studies: SMD, 0.01 [95% CI, -0.37 to 0.40];  $I^2=34.2%$  [95% CI, 0% to 76.9%]) or in favor of the intervention group (6 studies: SMD, -0.14 [95% CI, -0.61 to 0.32];  $I^2=51.0%$  [95% CI, 0% to 80.6%]) at 1-year and 12-week follow-up. Compared with usual care or no or minimal intervention, we found a no association of preoperative exercise with hospital LOS (3 studies: MD, -0.21 [95% CI, -0.74 to 0.31];  $I^2=0%$  [95% CI, 0% to 13.4%]) at a moderate rating of certainty

**Conclusion:** There was very low quality evidence that preoperative exercise programs were not associated with better results than usual care or no or minimal intervention for self-reported physical function and moderate quality evidence for the lack of association with hospital LOS.

**Key points:**

- There was no significant effect size in favor of the usual care or no or minimal control group
- At the follow-up closest to 1 year, we found no statistically significant association of postoperative exercise with physical function
- At the follow-up closest to 26 weeks, there was no statistically significant association of postintervention exercise with physical function for the intervention compared with the usual care or no or minimal intervention
- Preoperative exercise interventions vs usual care or no or minimal intervention was not associated with self-reported physical function

**Why I chose it:** I chose this article because it is a systemic review, and meta-analysis that compares pre-operative exercise, and post-operative exercise of patients who underwent total hip replacement, and if either pre-op or post-op exercise had any affect on the patients physical function, as well as pain intensity, quality of life, gait speed, lower body muscle strength, lower body flexibility, anxiety, hospital length of stay.





Summary of Evidence:

| Author (Date) | Level of Evidence | Sample/Setting<br>(# of subjects/ studies,<br>cohort definition etc. ) | Outcomes Studied | Key Findings | Limitations and Biases |
|---------------|-------------------|--|------------------|--------------|------------------------|
|---------------|-------------------|--|------------------|--------------|------------------------|

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|-----------|----------------------------|--|---|--|--|
| 3/31/2020 | Level 1-: Systemic Review: | included studies reported data on a total of 1175 patients, with an average age ranging from 66 to 76.9 year | prepare patients for surgery through a “prehabilitation” program, composed of strengthening and stretching exercises in the immediate preoperative period | <p>In one trial no difference occurred between study and control groups. In the other two papers reported better functional outcomes in the intervention group. Specifically, the time up and go (TUG) test and 6-minute walking test (6MWT) were better performed at 6 weeks after surgery by those patients managed with preoperative program of strengthening. In another paper no difference was observed in length of stay, with an average time of 6 days in the study group (range 5–22 days) and of 6 days in the control group (range 4–7 days), with a p = 0.228</p> <p>In the study group at 12 and 24 weeks, and a greater stride length and increased gait speed were observed at 3, 12 and 24 weeks after surgery in those patients treated with a personalized activity program</p> | Potential limitations of the present systematic review include the narrow electronic research frame, as only two online databases have been searched. Furthermore, given the language capabilities of the author, only studies published in English have been retrieved and analyzed. This is a bias which may have reduced the pool of retrieved papers |
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|  |  |  |  | <p>Slight modification of the exercise program did not yield significant differences in results, in fact in the trial by VanLeeuwen et al. No difference occurred between groups where progressive strength training was added to standard muscle strengthening</p> |  |
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| 5/30/2022 | Level 1-Systemic Review | <p>Adult patients with hip osteoarthritis and with the research question of how preoperative intervention (exercise, education) compared with no intervention prior to total hip replacement implantation affects postoperative status. Strength training, walking with assistive devices such as crutches, functional activities, mobility, and cardiovascular training were considered exercise interventions. The search strategy described above identified 400 potentially relevant studies. Based on title and abstract, 332 studies were determined to be irrelevant. A further 54 articles were excluded after full text screening. A final total of 14 studies were included in the systematic review</p> | <p>Determine whether prehabilitation before total hip arthroplasty, in the form of exercise therapy, education alone, or both together, improves postoperative outcomes, such as physical functioning, compared with no intervention.</p> | <p>13 trials provided results on physical functioning, with six showing significant improvements. The authors found an improvement in hip flexion ROM, WOMAC, 6MWT, hip muscle strength, and gait velocity. A significant improvement in the 36-item Short Form Survey (SF-36) vitality subscore without reporting exact numbers. They reported a significant interaction effect between group and follow-up time point regarding vitality and mental health in favor of the intervention group one year after surgery</p> <p>Ten RCT examined how reported postoperative pain differed between the two groups and found a trend towards a lower pain level (2.1 vs. 3.1 in the VAS or 9.3 vs. 10.6 in the WOMAC pain score).</p> <p>prehabilitation had an impact on the need for postoperative</p> | <p>A limitation of this study is that due to the heterogeneity of the reported outcomes, it was not possible to carry out a meta-analysis and to evaluate the results statistically using odd ratios. In addition, some of the included randomized controlled trials had a small number of patients</p> |
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|           |              |   |   |  |  |
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|           |              |   |   | <p>physiotherapy and occupational therapy. They found that the intervention group needed significantly less physiotherapy and occupational therapy (physiotherapy 7.3 vs. 9.4 sessions and occupational therapy 2.2 vs. 3.1 sessions). In addition, the absolute therapy time required was less (physiotherapy 163.8 vs. 228.2 min and occupational therapy 55.6 vs. 75.8 min)</p> |  |
| 4/24/2020 | Level 2: RCT | <p>3–12 months follow-up of a randomized controlled. Randomized controlled trial in patients diagnosed with hip OA and scheduled for THA. The intervention group (IG) performed supervised preoperative progressive explosive-type RT twice a week for 10 weeks; four exercises</p> | <p>Investigate the efficacy and feasibility of progressive explosive type resistance in patients with osteoarthritis of the hip scheduled for total hip arthroplasty.</p> | <p>Data from 85% of study participation were available at 12 months. No superior effects were observed at 12 months for HOOS ADL (between-group change score [95%CI]) (2.6 [-4.2; 9.8], <math>P = 0.44</math>) or remaining subscales. However, ascending (1.3 s [0.3; 2.3], <math>P = 0.01</math>) and</p>  | <p>This study is a follow-up to a RCT that has not been completed, thus the present analyse are not blinded for patient allocation by a third person who is not involved in the study. Additionally, The exclusion of patients with severe needs for</p> |

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|           |  | (hip/thigh) performed in three series each (8–12 repetition maximum). The control group (CG) received 'care as usual'. Eligible participants were: patients ( $\geq 50$ years) diagnosed with primary hip OA   |  | descending stairs (1.6 s [0.3; 2.9], $P = 0.01$ ) demonstrated additional effects.<br><br>At 3 months there was a superior effect on quadriceps muscle function, which is otherwise known to be reduced in THA patients  | walking assistance, hinder the implications in patients with major pre-operative mobility deficits. The shorter waiting time of up to 6 weeks to surgery in the control group may affect the internal validity   |
| 4/13/2023 | Level 1: Systematic review and meta-analysis | The authors searched Embase, Cochrane, and Published trials, were pooled using a random-effects model. Recommendations were determined using the Grading of Recommendations Assessment, Development and Evaluation system and the study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guideline. Forty-eight unique trials involving 3570 unique participants (2196 women [61.5%]; mean [SD] age, 64.1 [9.1] years) were analyzed | To evaluate whether prehabilitation is associated with improved preoperative and postoperative outcomes compared with usual care for patients undergoing orthopedic surgery. | Preoperatively, moderate-certainty evidence favoring prehabilitation was reported for patients patients undergoing total hip replacement (THR) for HRQOL on the 36-item Short Form Health Survey (weighted mean difference [WMD], 7.35 [95% CI, 3.15-11.54]) and muscle strength and abduction (SMD, 1.03 [95% CI, 0.03-2.02]) | This article is a systematic and meta-analysis of RCT. However, this study included not only hip replacement, but also knee replacement, and lumbar surgery. The authors note that the trials reviewed showed moderate-to-high risk of bias and heterogeneity in the meta-analysis, which commonly reduced certainty of evidence recommendations to low or very low. Moderate- and high-certainty evidence |

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| 2/26/2021 | Level 1: Systematic review and meta-analysis | The primary prespecified outcome was self-reported physical function. Secondary prespecified outcomes were self-reported pain intensity, quality of life, gait speed, lower body muscle strength, lower body flexibility, anxiety, hospital length of stay, and adverse events. A total of 32 randomized clinical trials with 1753 patients were included in the qualitative synthesis, and 26 studies with 1004 patients were included in the meta-analysis | Preoperative and postoperative exercise interventions are commonly used in patients with total hip arthroplasty despite a lack of established efficacy. To explore clinical outcomes associated with exercise training before and after hip arthroplasty. | There was no significant effect size in favor of the usual care or no or minimal control group (4 studies: SMD, 0.01 [95% CI, -0.37 to 0.40]; $I^2=34.2%$ [95% CI, 0% to 76.9%]) or in favor of the intervention group (6 studies: SMD, -0.14 [95% CI, -0.61 to 0.32]; $I^2=51.0%$ [95% CI, 0% to 80.6%]) at 1-year and 12-week follow-up. Compared with usual care or no or minimal intervention, we found a no association of preoperative exercise with hospital LOS (3 studies: MD, -0.21 [95% CI, -0.74 to 0.31]; $I^2=0%$ [95% CI, 0% to 13.4%]) at a moderate rating of certainty | There are several limitations to this meta-analysis, and systemic review. The authors <b>could not assess the impact of publication bias owing to too few studies</b> . Furthermore could not include all studies in the meta-analytic summaries owing to a lack of a sufficient number of studies for some outcomes. e. A further limitation of our study was that we did not assess important covariates, such as the association of age with the outcomes, owing to the low number of studies to perform a robust meta-regression. |
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**Conclusion:** Briefly summarize the conclusions of each article then provide overarching conclusion

**Article 1:** It is not clear if specific exercise programs improve surgical outcomes and postoperative parameters of the patient, including the length of stay in the hospital and the quality of life.

**Article 2:** Pre-rehabilitation in the form of exercise was an effective pre-rehabilitation measure with regard to postoperative physical functioning concerning actively conducted assessments like chair rise test, gait speed or stair climbing.

**Article 3:** The study could not confirm the hypothesis, that preoperative intervention program with progressive explosive-type RT of medium to high intensity for a duration of 10 weeks with two weekly training sessions was superior in improving postoperative physical function as well as muscle strength compared with THA alone.

**Article 4:** There is moderate certainty evidence supporting pre-rehabilitation over usual care in improving preoperative function and strength as well as health-related quality of life for total hip replacement.

**Article 5:** There was very low quality evidence that preoperative exercise programs were not associated with better results than usual care or no or minimal intervention for self-reported physical function and moderate quality evidence for the lack of association with hospital length of stay.

**Overarching Conclusion:** Current research does support that pre-rehabilitation exercise does help patient regain mobility quicker, and has a positive impact by reducing pain, and improving quality of life once patients have had a total hip replacement.

#### **Weight Of Evidence:**

**Article 1:** I ranked this # 4 because it's behind article number 5, and 4 in terms of most recent publication when it comes to systemic review & meta-analysis. The authors searched across a variety of databases such as google scholar, coarance, and PubMed. The authors made sure to include RCT, and cohort studies as well. The paper found some evidence that pre-rehabilitation does provide benefits, but in the end it couldn't conclude with certainty if it improved quality of life or post-operative outcomes

**Article 2:** I rank this as # 2 because it was published last year and is a systemic review. Also, the authors of this paper also looked at different types of pre-rehabilitation programs such as strength training, walking with assisted devices, functional activity, and

cardiovascular training to see if any of those pre-rehabilitation program was beneficial to patients. The authors did find pre-rehabilitation was effective.

**Article 3:** I rank this article as # 5 because it's an RCT and is a foreign study that is a follow-up to an incomplete RCT. The RCT was double-blinded however the follow-up was not blinded for patient allocation by a third person who is not involved in the study. Additionally the authors did not find any additional benefit of 10 weeks of pre-operative exercise.

**Article 4:** I rank this article # 1 it's a systemic review & meta-analysis that was published in April 2023, which means it has the most relevant and highest quality literature to address my topic. The researchers searched multiple databases such as Embase, and Cochrane. From there they pooled articles using a random-effects model. Recommendations were determined using the Grading of Recommendations Assessment, Development and Evaluation system and the study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. The researches not only looked at total-hip replacement, but other orthopedic surgeries as well such as total knee replacement, and lumbar surgeries. The authors found that pre-rehabilitation is beneficial and patients improved function, strength, and had a better quality of life.

**Article 5:** I rank this article as # 3 as it is a recently published systemic review that searched databases such as PubMed, Cochrane Central Register of Controlled Trials. Even though it was a systemic review, one drawback was that the authors note there were few articles to analyze. In the end the authors found no benefits with pre-rehabilitation exercise.

### **Magnitude of effects/statistical significance:**

**Article 1:** The time up and go (TUG) test and 6-minute walking test (6MWT) were better performed at 6 weeks after surgery by those patients managed with preoperative program of strengthening. In another paper no difference was observed in length of stay, with an average time of 6 days in the study group (range 5–22 days) and of 6 days in the control group (range 4–7 days), with a  $p = 0.228$

**Article 2:** A significant improvement in the 36-item Short Form Survey (SF-36) vitality subscore without reporting exact numbers. They reported a significant interaction effect between group and follow-up time point regarding vitality and mental health in favor of the intervention group one year after surgery. prehabilitation had an impact on the need for postoperative physiotherapy and occupational therapy. They found that the intervention group needed significantly less physiotherapy and occupational therapy

(physiotherapy 7.3 vs. 9.4 sessions and occupational therapy 2.2 vs. 3.1 sessions). In addition, the absolute therapy time required was less (physiotherapy 163.8 vs. 228.2 min and occupational therapy 55.6 vs. 75.8 min).

**Article 3:** Data from 85% of study participation were available at 12 months. No superior effects were observed at 12 months for HOOS ADL (between-group change score [95%CI]) (2.6 [-4.2; 9.8],  $P = 0.44$ ) or remaining subscales. However, ascending (1.3 s [0.3; 2.3],  $P = 0.01$ ) and descending stairs (1.6 s [0.3; 2.9],  $P = 0.01$ ) demonstrated additional effects.

**Article 4:** Preoperatively, moderate-certainty evidence for patients undergoing total hip replacement (THR) for HRQOL on the 36-item Short Form Health Survey (weighted mean difference [WMD], 7.35 [95% CI, 3.15-11.54]) and muscle strength and abduction (SMD, 1.03 [95% CI, 0.03-2.02]). Improvements in muscle strength were also reported to be statistically significant for hip abductors in patients undergoing Total hip replacement.

**Article 5:** Preoperative exercise interventions vs usual care or no or minimal intervention was not associated with self-reported physical function. There was no significant effect size in favor of the usual care or no or minimal control group (4 studies: SMD, 0.01 [95% CI, -0.37 to 0.40];  $I^2=34.2\%$  [95% CI, 0% to 76.9%]) or in favor of the intervention group (6 studies: SMD, -0.14 [95% CI, -0.61 to 0.32];  $I^2=51.0\%$  [95% CI, 0% to 80.6%]) at 1-year and 12-week follow-up

**Clinical Bottom line/significance:** Total hip replacement is a major surgery and rehabilitation can take several weeks before the patient is back to baseline. By implementing a pre-rehabilitation phase prior to surgery it is very possible that we can see patients mobility improve quicker, be in less pain, and have improved quality of life when paired with post-op rehabilitation as well. It should be noted that none of these articles believe that post-op rehab should be replaced for pre-rehabilitation. Instead having a pre-op, and post-op phase for hip replacement can be beneficial to the patient, but also reduce cost by reducing hospital stay, and spending less time in rehabilitation. Patient will be able to get back to baseline a lot quicker if both are implemented.

**Other Considerations:** Further larger, and randomized trials are needed in answering whether pre-rehabilitation can improve mobility quicker, reduce pain, and increase quality of life. There also needs to be able quantify how long pre-rehabilitation should take, and what type pre-rehabilitation has the most benefit should it be aerobic exercise, or strength training, or combination of both for the best outcome? My last article found no improvement in physical function from pre-rehabilitation or post-rehabilitation, and this was due to the lack of sufficient studies.

|   | Cultural Context:  | Social Context  | Economic Context  | Language  |
|---|--|---|---|---|
| <p><b>Article 3:</b><br/>Effects of progressive resistance training prior to total HIP arthroplasty – a secondary analysis of a randomized controlled trial</p> | <p>This study was done at Herlev University Hospital, Copenhagen, Denmark. Denmark has universal healthcare, and high standards of living.</p> | <p>The study was overseen by an ethics board and approved by the Scientific Ethics Committee, Region of Copenhagen.</p> | <p>Has a high standard of living, is a high-index country when compared to the United States.</p> | <p>Only Dutch speaking participants were eligible for this study, and All primary hip OA patients scheduled for THA were registered and contacted by the principal author for eligibility. Study-information was given in oral and written form. All participants gave informed written consent. The study followed the CONOSRT guidelines for RCT. Also, the study is registered in ClinicalTrials.gov</p> |

Foreign Study:

