# Functional Outcomes in Pain Management: Non-Surgical vs. Surgical Rotator Cuff Interventions: A Systematic Review

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**Abstract:** This systematic review explored functional outcomes for pain management when comparing non-surgical vs surgical intervention for rotator cuff tears in adults. Rotator cuff tears are common injuries. Seven studies contained relevant information regarding surgical vs non-surgical interventions for rotator cuff injuries. The significance of the findings suggest that both surgical and non-surgical treatments can be successful in improving rotator cuff injuries. Surgical intervention can aid in overall pain reduction and healing. Whereas non-surgical interventions such as physical and occupational therapy can also be beneficial in encouraging recovery and easing symptoms.

**Importance:** This systematic review explored functional outcomes of non-surgical versus surgical interventions for rotator cuff tears in adults, a prevalent issue in workplace related injuries. Understanding the comparative effectiveness of these types of interventions may inform evidence-based practice, improve patient care, and have a positive impact on rehabilitation outcomes. Rotator cuffs tears have a significant impact on occupational performance and quality of life. Research is essential for guiding therapeutic decision making and optimizing pain management strategies in clinical settings.

**Objective:** To identify, evaluate, and synthesize the current literature concerning non-surgical vs surgical rotator cuff interventions to determine the efficacy of these interventions and understand the route people should go with their own recovery process.

**Data Sources:** A literature search occurred on May 17, 2024. Follow up searches were conducted on May 24, 2024. Databases included MEDLINE, CINAHL Complete, Academic Search Complete, using Hawai'i Pacific University's online library databases. Search terms included (rotator cuff tear or rotator cuff injury or rotator cuff pain) AND (occupational therapy or occupational therapist or occupational therapists or ot) AND (adults or adult or aged or elderly), as well as combinations of these terms.

**Study Selection and Data Collection:** This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Published studies on non-surgical and/or surgical interventions for rotator cuff injuries were included in the

systematic review. Data from presentations, non-peer reviewed literature, and dissertations were excluded.

**Findings:** Eight studies were included. There was one Level I study, three Level II studies, and four Level III studies according to the American Occupational Therapy Association's Levels of Evidence. The outcomes of these studies indicate that both non-surgical and surgical interventions led to positive results in the rehabilitation for patients with rotator cuff injuries. The degree of those benefits vary based on how long it took to begin rehabilitation and the degree of damage in the rotator cuff injury. Patients who see limited results with traditional rehabilitation are recommended for surgical intervention.

**Conclusion and Relevance:** Both non-surgical and surgical interventions are effective in improving pain, strength, range of motion, and occupational performance outcomes for adults with rotator cuff injuries. Surgical intervention should primarily be utilized only after non-surgical interventions prove ineffective.

**What This Systematic Review Adds:** There are limited high quality studies that evaluate the comparison of non-surgical vs surgical intervention outcomes for rotator cuff injuries. This systematic review provides a starting point for evaluating the efficacy of the treatment outcomes post non-surgical and/or surgical treatment in OT practice. More research is needed to determine which path is best for individuals who have suffered rotator cuff injuries and require rehabilitation. There should be further studies exploring the impact of occupational therapy rehabilitation on performance outcomes for individuals with rotator cuff injuries.

**Key words:** Functional outcomes, Non-surgical, Pain, Rotator cuff or rotator cuff injuries or rotator cuff tears, Surgical

## Introduction

Rotator cuff tears are a common musculoskeletal injury, particularly among adults who are engaged in occupations that are physically demanding. These injuries can lead to significant pain, decreased range of motion, and impaired functional abilities, ultimately affecting an individual's capacity to engage in daily activities and occupational tasks. In addition, rotator cuff injuries also cause economic burdens due to increased healthcare costs, decreased productivity at work and sometimes job and income loss.

The two primary solutions for rotator cuff tears include surgical and non-surgical interventions. Non-surgical interventions are more commonly recommended as initial approaches for mild cases and partial tears. Interventions include but are not limited to rehabilitation therapy, corticosteroid injections, and activity modification. Surgical interventions are typically necessary for more significant tears and cases that do not respond to non-surgical interventions. Studies have shown varying results, some suggesting that surgical repair can lead to better long term functional outcomes and pain relief, while other studies claim that non-surgical interventions can be equally effective and noninvasive. This systematic review focused on examining and synthesizing published evidence, to better understand the functional outcomes associated with surgical and non-surgical interventions.

## Method

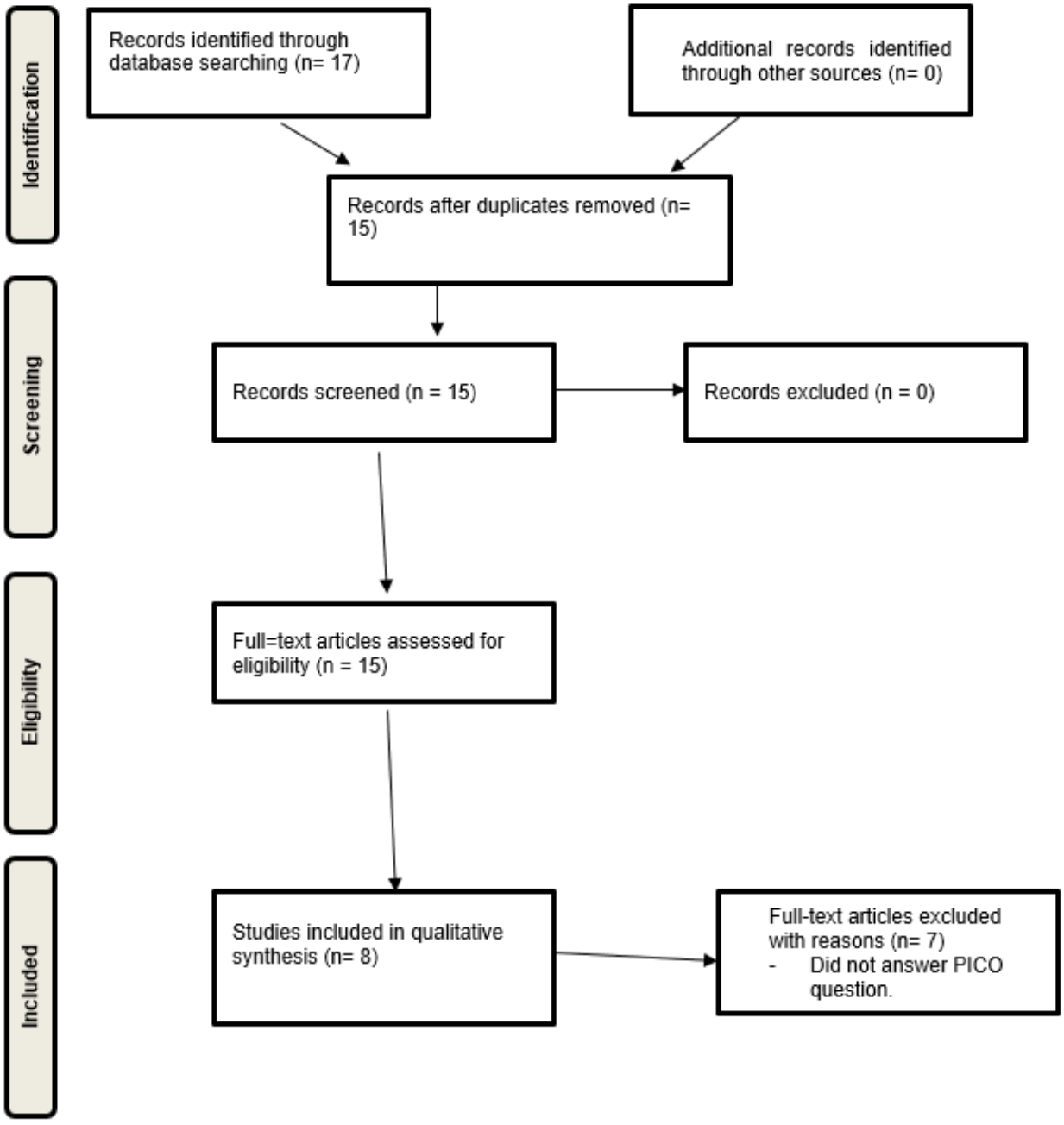
A systematic review of seven studies was conducted. All studies were assessed for risk of bias, level of evidence, and quality using the Cochrane guidelines. The systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and incorporated recommended processes for conducting a systematic review. The guiding research question for this systematic review was: How do functional outcomes and pain differ between adults with non-surgical and surgical rotator cuff repair? The interventions were categorized into two themes: surgical and non-surgical.

A broad search of the literature occurred on May 17, 2024. An additional search was conducted on May 24, 2024 to ensure all relevant research was included. The inclusion criteria for studies in this systematic review were as follows: peer-reviewed, published in English, and dated between 2014-2024. Exclusion criteria, in addition to those studies that did not meet the inclusion criteria, included articles that were systematic reviews, scoping reviews, dissertations, and presentations. Databases included MEDLINE, CINAHL Complete, Academic Search Complete using Hawai'i Pacific University's online library databases. Search terms included (rotator cuff tear or rotator cuff injury or rotator cuff pain) AND (occupational therapy or occupational therapist or occupational therapists or ot) AND (adults or adult or aged or elderly), as well as combinations of these terms. Appendix A provides an extensive list of all search terms used for

this systematic review. The initial search included 17 articles related to the research topic (Figure 1). Four independent reviewers completed the screening and selection of the studies, assessed their quality, and extracted the data.

**Figure 1**

*Flow Diagram*



## Results

Seven studies met the inclusion criteria. The articles were assessed according to their risk of bias, level of evidence, and quality. This systematic review included seven studies that contained relevant information regarding surgical vs non-surgical interventions for rotator cuff injuries. The information from these articles was divided into two themes: surgical interventions and non-surgical/conservative interventions. An evidence table is provided in Appendix B. The Cochrane risk-of-bias guidelines were used to assess each article and are provided in Appendix C.

### Surgical Intervention

Three of the seven studies on the topic discussed the efficacy of therapy post rotator cuff surgery. One study was a Level 3B study (Stern et al., 2024), one study was a Level 1B study (Moosmayer et al, 2014), and one study was a Level 2B study (Arias-Buría et al. 2015). See Appendix B. All studies provided evidence that surgical intervention is effective and potentially beneficial.

Stern et al. (2024) focused on both the utilization of PT and OT services after rotator cuff repair. Participants were aged between 18-64 years old and underwent surgery between 2017-2020. The IBM market scan found that among 53,497 patients who underwent rotator cuff repair, 81.2% initiated rehabilitation. Specific and regional differences indicated opportunities to improve quality of care.

Moosmayer et al. (2014) studied the effects of utilizing physiotherapy as a non-surgical intervention compared to surgical intervention. The results found that 24% of patients initially treated with physiotherapy required secondary surgical repair. The primary tendon repair surgical intervention yielded positive results; however, surgical repair results were not significant enough to be the primary choice of treatment. In the study, physiotherapy was found to be the better intervention over surgery for rotator cuff injuries.

Arias et al. (2015) studied patients who still experienced shoulder pain post operation. They identified that healing time in rotator cuff injuries takes longer to heal post operation due to longer healing time for the tissue. The study also found that rehabilitation was needed for sufficient recovery and to reduce patients' pain levels. Evidence suggests that the sooner rehab is initiated, the faster the overall recovery time and quality.

Limitations of the studies on surgical interventions for rotator cuff injuries and recovery evaluation and treatment codes that might not align with all the elements of rehabilitation (Stern et al., 2024); use of commercial insurance data that may not represent an entire population (Moosmayer et al., 2014); lack of standardized interventions and surgical

approaches; small sample size, lack of control group, and duration of intervention (Arias et al., 2015).

**Non-surgical Intervention**

Five of the seven studies on the topic discussed the efficacy of non-surgical rotator cuff intervention. Two studies were Level 2B (Christensen et al., 2016; Menek et al., 2019) and three studies were a Level 3B (Diego et al., 2019; Garcia et al., 2019; Lou et al., 2014). All studies provided evidence that non-surgical intervention is effective and potentially beneficial.

Christensen et al. (2016) studied the effectiveness of a therapeutic neuromuscular exercise program for individuals with irreparable rotator cuff injuries. The exercise program focused primarily on muscle strengthening of the teres minor and deltoid muscles. The results demonstrated significant improvements in shoulder strength, function, pain reduction, and quality of life. Range of motion was limited and inconsistent at the end of the study. Overall, the study demonstrated the use of therapeutic exercise as an effective and appropriate treatment intervention for rotator cuff injuries.

Menek et al. (2019) studied patients who never had shoulder surgery for their rotator cuff injury. The study found that when active mobilization technique was incorporated with general rehab, there were significant positive outcomes for recovery. This showcased treatment without surgery is a viable option if recovery occurs at a consistent pace and is pain free.

Garcia et al. (2019) evaluated 297 older adult participants who were diagnosed with rotator cuff related shoulder disorders and were managed through physical therapy treatment. Patients with a Quick DASH score that was less than or equal to 20 were considered positive responders to physical therapy and a successful outcome. Results indicated rehabilitation was an effective intervention for the patient population.

Diego et al. (2019) studied seven participants (six female and one male), with upper limb impairments between the ages of 50-79 years old. They all presented with musculoskeletal injuries in the right upper limb, with no cognitive impairments. Patients wore a powered exoskeleton to maximize recovery. The patients were instructed to perform movements using the exoskeleton. To gather outcome information, the researchers gave the patients a questionnaire. Results showed that patients felt safe using the exoskeleton during testing. One patient indicated that they needed assistance from someone who had more knowledge of the device.

## Discussion

The results of this systematic review suggest that both surgical and non-surgical treatments can be successful in improving rotator cuff injuries. Surgical intervention can aid in overall pain reduction and healing. Whereas non-surgical interventions such as physical and occupational therapy can also be beneficial in encouraging recovery and easing symptoms. The studies demonstrate that early treatment is optimal for the best outcomes. When treatment is started promptly, it can assist in eliminating chronic pain and improving mobility. Ultimately, the choice of intervention will depend on several components including the patient's preferences, seriousness of injury, accessibility of treatment options, and the patient's overall health.

The studies on surgical and non-surgical interventions for rotator cuff injuries have several limitations. For surgical interventions, the reliance on evaluation and treatment codes, use of commercial insurance data, and non-standardized procedures, including changing surgical techniques and varying surgical pathologies, were significant issues. Additionally, small sample sizes, short-term interventions, and lack of control groups were also limitations of the findings. Similarly, non-surgical intervention studies also faced challenges, such as small sample sizes, lack of control groups, and the absence of blinding, which affected data reliability. The validity of findings was limited due to single-center studies and specific participant criteria. Additionally, insufficient data processing and lack of patient consent further undermined the validity of the results across these studies.

## Limitations

Limitations in this systematic review include a limited number of studies on the topic. Additionally, some of the studies reflected physical therapy rather than occupational therapy for rehabilitation of rotator cuff injuries. Occupational therapy could play a large role in the recovery process for individuals which could have changed the findings in this analysis. Future research should focus on addressing this disparity in clinical research from different professions on the therapeutic benefits to the recovery time in rotator cuff injuries.

## Implications for Occupational Therapy Practice

The findings of this systematic review indicate that both surgical and non-surgical interventions can effectively improve pain, strength, range of motion, and occupational performance in adults with rotator cuff tears. Non-surgical interventions, including occupational therapy can lead to positive recovery outcomes, especially when started early. Surgical interventions are more beneficial for significant tears that don't respond well to non-surgical treatments. Given the limitations found in existing studies, including small sample sizes and research primarily focused on physical therapy, there is a significant opportunity for

occupational therapy to contribute to research. Occupational therapists can play a crucial role in non-surgical rehabilitation by developing personalized therapeutic exercise programs and functional activity modifications that enhance patients' recovery and quality of life. Future research should include standardized occupational therapy interventions to better understand their impact on recovery from rotator cuff injuries.

**Key Takeaways**:

- Early intervention is critical to achieving optimal recovery outcomes.
- Both surgical and non-surgical interventions are effective for improving pain, strength, range of motion, and occupational performance in rotator cuff tears.
- Further research focused on OT interventions for rotator cuff injuries is needed.
- OT provides personalized treatment plans, exercise programs, and activity modifications to support recovery. Further research should be done to see the effectiveness of OT in potentially reducing the number of surgical interventions needed.

## Conclusion

Studies included within this systematic review provide evidence on the effectiveness of non-surgical intervention for rotator cuff tears. Non-surgical interventions can effectively manage rotator cuff tears, emphasizing rehabilitation and therapy over immediate surgery. Surgery can lessen pain and facilitate healing, but overall involves a longer recovery time with possible complications. When started early, non-surgical treatments such as occupational therapy and physical therapy are beneficial as they can increase mobility without surgery and associated complications.

The studies reviewed have some limitations that affect reliability and validity of their findings. For surgical interventions, limitations included relying on health insurance data, different surgical methods and small study sizes. For non-surgical treatments, limitations included no control groups and participants knowing what treatment they were receiving.

Further research should focus on addressing these limitations with larger sample sizes, standard treatment methods and using control groups. Ultimately, the decision between surgical and non-surgical interventions is a personal decision based on severity of injury, preferences, access to care, and overall health of the patient. A personalized approach can determine the best health outcomes for the patient with a rotator cuff injury.

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**Appendix A: Search Terms**

*Search Terms*

| |
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| rotator cuff tear or rotator cuff injury or rotator cuff pain |
| AND |
| occupational therapy or occupational therapist or occupational therapists or ot |
| AND |
| adults or adult or aged or elderly |

**Appendix B**

*Evidence Table*

| **Rotator Cuff Repair Evidence Table** | | | | | |
|---|---|---|---|---|---|
| **Author/ Year** | **Level of Evidence Study Design Risk of Bias** | **Participants Inclusion Criteria Study Setting** | **Intervention and Control Groups** | **Outcome Measures** | **Results** |
| Stern et al. (2024) | 3B | Participants aged between 18-64 years old, undergone rotator cuff repair between 2017-2020 **Setting**: IBM Market Scan | Patients receiving PT, patients receiving OT, patient receiving no formal rehabilitation | Days to initiate therapy, number of visits, urban vs rural differences, | Patients in rural areas were less likely to receive rehab, OT services were underutilized in comparison to PT |
| Lou et. al. (2014) | 3B | Patients with repairable rotator cuff tears, scheduled for (ARCR) 52 patients **Setting**: Orthopedic clinical setting | Patients with higher preoperative grip strength and Patients with lower preoperative grip strength | Functional outcomes were measured using Quick DASH | Higher baseline grip strength was a positive result of post operative shoulder function |
| Garcia et al. (2019) | 3B | 297 older adult participants who were diagnosed with rotator cuff related shoulder disorders and managed through PT treatment **Setting:** Dataset of 1109 Patients with shoulder Disorders | Patients receiving PT (observational study) | Patients who had a discharge score of < or = 20 on the Quick DASH were considered positive responders for a successful outcome | 63.3% were positive responders who met the MCID thresholds for the Quick DASH. |
| Diego et al. (2021) | 3B | Total of 7 participants (6 women 1 man) with upper limb impairments between the ages | Patients wear a powered exoskeleton to maximize recovery. | Patients should be able to perform movements using the | The interpretation of the SUS score was classified as excellent |

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|---|---|---|---|---|---|
| | | of 50-79 years old. Presented with musculoskeletal injury in the right upper limb and over 18 with no cognitive impairments. **Setting:** Clinic Center in Spain | | exoskeleton with little to no pain. Outcome measures were gathered through a 10-question questionnaire. | in acceptability, and the patients stated through the questionnaire that they felt safe during testing with a patient with the lowest score indicating that they needed assistance from someone with knowledge of the device. |
| Christensen et al. (2016) | 2B | The participants inclusion criteria included patients who experienced symptoms of rotator cuff rupture for at least three months with rupture of minimum m. supraspinatus and m. infraspinatus visualized by ultrasonography or arthroscopy, no neurological conditions which could affect muscle strength or activity and were able to read and understand Danish. Both patients with and without a history of shoulder trauma and a confirmed diagnosis by ultrasonography or arthroscopy. **Setting**: Orthopedic clinical setting | 30 Participants completed a 5-month, focused exercise program. No Control Group reported | The primary outcome measure was the self-reported Oxford Shoulder Score (OSS) questionnaire. The secondary outcome measures were the EQ-5D-5L Questionnaire, ROM testing, Strength testing, Dynamic flexion testing, and muscle activity testing | Results showed significant improvement for quality of life, pain reduction, dynamic flexion, and self-reported shoulder function. The measurements of muscle activity with surface electromyography did not yield significant changes/results. |

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|---|---|---|---|---|---|
| Moosmayer et al. (2014) | 1B, RCT | The participants inclusion criteria were pain at rest or exercise laterally on the shoulder; a painful motion arc; a positive impingement sign; passive shoulder motion of at least 140° for abduction and flexion; demonstration of a full-thickness tear of the rotator cuff by both sonography and MRI, with a tear size not exceeding 3 cm on sonography; and muscle atrophy not exceeding stage 2 on MRI. Acute tears, acute-on-chronic tears, and chronic tears were included.<br>**Setting**: secondary care institution | 52 Patients of the intervention group had surgical primary tendon repair. 51 patients of the control group received physiotherapy and had the option of surgical repair if necessary. | The primary outcome measure was the constant score. The secondary outcome measures were the Self-report section of the American Shoulder and Elbow Surgeons (ASES) score. Physical component summary measure of the Short Form 36 Health Survey (SF-36). Measurement of pain, strength, and pain-free shoulder mobility. Patient satisfaction on a 10-cm visual analog scale (VAS). Imaging results from MRI and ultrasound. | Primary tendon repair showed slightly better results when evaluating shoulder pain, shoulder function, and patient satisfaction. Surgical repair results were not significant enough to be the first choice of treatment. Physiotherapy is highly encouraged and only consider surgery if physiotherapy doesn't yield significant improvement in condition. |
| Menek et al. (2019) | 2B, RCT | 30 patients with rotator cuff syndrome. Inclusion: between 30-70 years old, partial rupture and suffering from rotator cuff syndrome, no shoulder surgery.<br>**Setting:** clinical practice setting. | **Intervention:** 15 patients undergo 6 weeks of Mulligan technique (active accessory mobilizations of the humeral head into flexion, abduction, external and internal rotation) utilized in addition to physio | Outcomes were measured by testing pre and post scores for VAS(pain scale) score, ROM assessments (goniometer), DASH score (survey on upper limb function), and SF-36 score (daily | Scores for VAS, ROM, and DASH scores were statistically better in the intervention group compared to the control group, with both groups significantly improving compared to their baseline. No |

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| | | | treatment and exercise program. Must be pain free during movement or it is stopped. **Control:** 15 patients only complete standard physio treatment and exercise program for 6 weeks. | living activities evaluation scale). | significant difference between groups for the SF-36. Significant results can be found for shoulder treatment without surgery, including utilizing special treatments such as Milligan technique. |
| Arias-Buría, et al. (2015) | 2B, RCT | Patients with postoperative shoulder pain from Sep 2012-March 2013, signed informed consent, experienced their first attack of shoulder pain after the surgery and were naive to any treatment for postoperative shoulder pain. **Setting**: clinical practice | Healing post op takes longer due to healing time of the tissue. implement TrP-DN early in treatment for quicker rehab outcomes. apply needle to active TrP muscles during session to introduce healing on top of other manual rehab techniques in PT. | Constant-Murley score, a self-rated and performance-based measure. Higher score on this scale represents better function. | TrP-DN on top of PT improves healing, Strength and ADL function compared to PT alone. Better outcomes of healing in postoperative shoulder patients. |

**Appendix C**

*Risk-of-Bias Table*

| Risk-of-Bias Table for Randomized Controlled Trial (RCT) and Non-RCT (Two or More Group Design) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Selection Bias (Risk of bias arising from randomization process) | | | Performance Bias (effect of assignment to intervention) | | Detection Bias | | Attrition Bias | Reporting Bias | Overall risk-of-bias (low, moderate, high |
| Citation | Random Sequence Generation | Allocation Concealment (until participants enrolled and assigned) | Baseline difference between intervention groups | Blinding of Participants During the Trial | Blinding of Study Personnel During the Trial | Blinding of Outcome Assessment: Self-reported outcomes | Blinding of Outcome Assessment: Objective Outcomes (assessors aware of intervention received?) | Incomplete Outcome Data (data for all or nearly all participants | Selective Reporting (results being reported selected on basis of the results?) | |
| Moosmayer et al. (2014) | + | + | + | + | + | + | + | + | - | Low to moderate risk |
| Menek et al. (2019) | + | + | + | + | - | - | + | + | + | Low risk |
| Arias-Buría et al. (2015) | + | + | + | + | + | + | + | + | + | Low |

*Note*. Categories for risk of bias are as follows: Low risk of bias (+), unclear risk of bias (?), high risk of bias (–). Scoring for overall risk of bias assessment is as follows: 0–3 minuses, low risk of bias (L); 4–6 minuses, moderate risk of bias (M); 7–9 minuses, high risk of bias (H). Citation. Table format adapted from Higgins, J. P. T., Sterne, J. A. C., Savović, J., Page, M. J., Hróbjartsson, A., Boutron, I., . . . Eldridge, S. (2016). A revised tool for assessing risk of bias in randomized trials. Cochrane Database of Systematic Reviews 2016, Issue 10 (Suppl. 1), 29–31. https://doi.org//10.1002/14651858.CD201601

| Risk of Bias for Before-After (Pre-Post) Studies with No Control Group (One Group Design) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Citation | Study question or objective clear | Eligibility or selection criteria clearly described | Participants representative of real-world patients | All eligible participants enrolled | Sample size appropriate for confidence in findings | Intervention clearly described and delivered consistently | Outcome measures pre-specified, defined, valid/ reliable, and assessed consistently | Assessors blinded to participant exposure to intervention | Loss to follow-up after baseline 20% or less | Statistical methods examine changes in outcome measures from before to after intervention | Outcome measures were collected multiple times before and after intervention | Overall risk of bias assessment (low, moderate, high risk) |
| Christensen et al. (2016) | Yes | yes | Yes | Yes | Yes | yes | Yes | Yes | Yes | Yes | Yes | low risk |
| Alguacil-Diego et al. (2021) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low risk |
| Garcia et al. (2020) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low risk |
| Stern et al. (2024) | Yes | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Low to moderate risk |
| Li et al. (2024) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Low risk |

*Note*. Y = yes; N = no; NR = not reported. Scoring for overall risk of bias assessment is as follows: 0–3 N, Low risk of bias (L); 4–8 N, Moderate risk of bias (M); 9–11 N, High risk of bias (H).

Citation. Table format adapted from National Heart Lung and Blood Institute. (2014). Quality assessment tool for before–after (pre–post) studies with no control group. Retrieved from https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools