**Article Full Title**

The Effectiveness of Manual Therapy for Relieving Pain, Stiffness, and Dysfunction in Knee Osteoarthritis: A Systematic Review and Meta-Analysis

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**Paper Abstract**

Background: Knee osteoarthritis (KOA) is the most common form of arthritis, leading to pain disability in seniors and increased health care utilization. Manual therapy is one widely used physical treatment for KOA. Objective: To evaluate the effectiveness and adverse events (AEs) of manual therapy compared to other treatments for relieving pain, stiffness, and physical dysfunction in patients with KOA. Study Design: A systematic review and meta-analysis of manual therapy for KOA. Methods: We searched PubMed, EMBASE, the Cochrane Library, and Chinese databases for relevant randomized controlled trials (RCTs) of manual therapy for patients with KOA from the inception to October 2015 without language restrictions. RCTs compared manual therapy to the placebo or other interventional control with an appropriate description of randomization. Two reviewers independently conducted the search results identification, data extraction, and methodological quality assessment. The methodological quality was assessed by PEDro scale. Pooled data was expressed as standard mean difference (SMD), with 95% confident intervals (CIs) in a random effects model. The meta-analysis of manual therapy for KOA on pain, stiffness, and physical function were conducted. Results: Fourteen studies involving 841 KOA participants compared to other treatments were included. The methodological quality of most included RCTs was poor. The mean PEDro scale score was 6.6. The meta-analyses results showed that manual therapy had statistically significant effects on relieving pain (standardized mean difference, SMD = -0.61, 95% CI -0.95 to -0.28, P= 76%), stiffness (SMD = -0.58, 95% CI -0.95 to -0.21, P = 81%), improving physical function (SMD = -0.49, 95% CI -0.76 to -0.22, P = 65%), and total score (SMD = -0.56, 95% CI -0.78 to -0.35, P = 50%). But in the subgroups, manual therapy did not show significant improvements on stiffness and physical function when treatment duration was less than 4 weeks. And the long-term information for manual therapy was insufficient. Limitations: The limitations of this systematic review include the paucity of literature and inevitable heterogeneity between included studies. Conclusion: The preliminary evidence from our study suggests that manual therapy might be effective and safe for improving pain, stiffness, and physical function in KOA patients and could be treated as complementary and alternative options. However, the evidence may be limited by potential bias and poor methodological quality of included studies. High-quality RCTs with longterm follow-up are warranted to confirm our findings.

**NIH Risk of Bias Tool**

Quality Assessment of Systematic Reviews and Meta-Analyses

**Is the review based on a focused question that is adequately formulated and described?**

Yes

**Were eligibility criteria for included and excluded studies predefined and specified?**

Yes

**Did the literature search strategy use a comprehensive, systematic approach?**

Yes

**Were titles, abstracts, and full-text articles dually and independently reviewed for inclusion and exclusion to minimize bias?**

Yes

**Was the quality of each included study rated independently by two or more reviewers using a standard method to appraise its internal validity?**

Yes

**Were the included studies listed along with important characteristics and results of each study?**

**Was publication bias assessed?**

Yes

**Was heterogeneity assessed? (This question applies only to meta-analyses.)**

Yes

**Key Finding #1**

Eleven studies demonstrated that manual therapy significantly helps to relieve pain and stiffness, and significantly helps to improve physical function for greater than 4 weeks.

**Key Finding #2**

Regarding the long-term effect of manual therapy on osteoarthritis, only 3 studies were reported and long-term outcomes of manual therapy on OA need to be further explored.

**Key Finding #3**

**Key Finding #4**

**Please provide your summary of the paper**

This systematic review and meta-analysis investigated the effectiveness and adverse events of manual therapy compared to other treatments for relieving pain, stiffness, and physical dysfunction in patients with knee osteoarthritis. In total, fourteen studies involving 841 participants with knee osteoarthritis were reviewed. The meta-analyses results showed that manual therapy had a statistically significant effect on relieving pain, and stiffness, and improving physical function and total score. These findings suggest that manual therapy is an effective treatment for knee osteoarthritis, specifically for those experiencing pain, stiffness, and deficits in physical function as a direct result of their osteoarthritis. However, further research needs to be conducted to find the long-term effects of manual therapy.

**Please provide your clinical interpretation of this paper. Include how this study may impact clinical practice and how the results can be implemented.**

As stated in the article, knee osteoarthritis is the most common form of arthritis and is one of the leading causes for pain disability, especially in the older population. Manual therapy is a form of treatment that can relieve those primary symptoms of pain and stiffness that are experienced by a majority of the population suffering with knee osteoarthritis. In many cases, manual therapy is a much more preferable form of treatment when compared to other interventions i.e. pharmacological treatment. However, it seems as if manual therapy is at its most effective when combined with strength and mobility exercise. Therefore, it is important to stress compliance to a home exercise program in order to achieve the best results when treating patients for knee osteoarthritis with manual therapy.