**Article Full Title**

Strength training alone, exercise therapy alone, and exercise therapy with passive manual mobilization each reduce pain and disability in people with knee osteoarthritis: a systematic review

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**Paper Abstract**

Question: What are the effects of strength training alone, exercise therapy alone, and exercise with additional passive manual mobilization on pain and function in people with knee osteoarthritis compared to control? What are the effects of these interventions relative to each other? Design: A meta-analysis of randomized controlled trials. Participants: Adults with osteoarthritis of the knee. Intervention types: Strength training alone, exercise therapy alone (combination of strength training with active range of motion exercises and aerobic activity), or exercise with additional passive manual mobilization, versus any non-exercise control. Comparisons between the three interventions were also sought. Outcome measures: The primary outcome measures were pain and physical function. Results: 12 trials compared one of the interventions against the control. The effect size on pain was 0.38 (95% CI 0.23 to 0.54) for strength training, 0.34 (95% CI 0.19 to 0.49) for exercise, and 0.69 (95% CI 0.42 to 0.96) for exercise plus manual mobilization. Each intervention also improved physical function significantly. No randomized comparisons of the three interventions were identified. However, meta-regression indicated that exercise plus manual mobilizations improved pain significantly more than exercise alone (p = 0.03). The remaining comparisons between the three interventions for pain and physical function were not significant. Conclusion: Exercise therapy plus manual mobilization showed a moderate effect size on pain compared to the small effect sizes for strength training or exercise therapy alone. To achieve better pain relief in patients with knee osteoarthritis physiotherapists or manual therapists might consider adding manual mobilization to optimize supervised active exercise programs.

**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?**

Cannot Determine, Not Reported, Not Applicable

**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?**

No

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

Cannot Determine, Not Reported, Not Applicable

**Key Finding #1**

There is no way to determine which program is superior because no study directly compared the effect of all 3; this systematic review had to rely on indirect comparisons.

**Key Finding #2**

Exercise therapy combined with mobilizations was found to have a moderate effect on both pain and function in those with knee OA.

**Key Finding #3**

The addition of manual therapy in exercise programs may address connnective tissue damage thereby having a positive effect on hyperalgesia experienced by those with knee pain due to OA.

**Please provide your summary of the paper**

This systematic review of 12 randomized control trials was an indirect comparison of strength training, exercise training, or exercise with mobilizations to a control of no exercise on both pain and function in those with knee OA. The authors reviewed articles that only examined programs with supervised interventions, and no home exercise program. The primary outcome measures used to measure pain and function were the WOMAC, Lequesne Index, and VAS. Because no study compared all three interventions in one trial, a mixed-effects meta-regression model was used to make the indirect comparison. They found that overall, all 3 intervention groups showed improvements in function and pain; however, the experimental group that utilized both exercise and manual therapy had the greatest effect size.

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

There is not enough evidence to assume that one therapeutic technique is superior to another. Physical therapists should create unique plans of care that incorporate strength training, aerobic exercise, and active ROM exercises in addition to manual therapy. These programs should be based on the preferences of both the patient and physical therapist in order to create a program where the patient feels they have the most autonomy in order to see the most success.