

Research Paper Review

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Combined Hip & Knee Strengthening for Patellofemoral Pain – Systematic Review

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ABSTRACT

INTRODUCTION: The purpose of this study was to examine the efficacy of hip strengthening, associated or not with knee strengthening, to increase strength, reduce pain, and improve activity in individuals with patellofemoral pain.

METHODS: A systematic review of randomized and/or controlled trials was performed. Participants in the reviewed studies were individuals with patellofemoral pain, and the experimental intervention was hip and knee strengthening. Outcome data related to muscle strength, pain, and activity were extracted from the eligible trials and combined in a meta-analysis.

RESULTS: The review included 14 trials involving 673 participants. Random-effects meta-analyses revealed that hip and knee strengthening decreased pain (mean difference, -3.3; 95% confidence interval [CI]: -5.6, -1.1) and improved activity (standardized mean difference, 1.4; 95% CI: 0.03, 2.8) compared to no training/placebo. In addition, hip and knee strengthening was superior to knee strengthening alone for decreasing pain (mean difference, -1.5; 95% CI: -2.3, -0.8) and improving activity (standardized mean difference, 0.7; 95% CI: 0.2, 1.3). Results were maintained beyond the intervention period. Meta-analyses showed no significant changes in strength for any of the interventions.

CONCLUSION: Hip and knee strengthening is effective and superior to knee strengthening alone for decreasing pain and improving activity in persons with patellofemoral pain; however, these outcomes were achieved without a concurrent change in strength.

ANALYSIS

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Background Information

Patellofemoral pain, characterized by retro- or peripatellar pain worsened with activities such as squatting, sitting, stair climbing or running, is one of the most common musculoskeletal conditions presenting to general practice and sports medicine clinics (1). The pain from patellofemoral syndrome (PFS) can be present in both the short- and longterm, and while the exact etiology of the condition is unknown, it is thought to be multifactorial (2). Local factors related to the patellofemoral joint itself, plus non-local factors related to the distal and proximal joints are thought to contribute to symptoms.

Traditionally, rehabilitation programs have focused entirely on the local factors, incorporating knee bracing, and quadriceps strengthening to improve functionality and reduce pain (3, 4). Recent research suggests that the addition of hip exercises focusing on the hip abductors, lateral rotators and extensors may also be valuable in addressing symptoms of PFS (5). Despite several systematic reviews attempting to examine the role of exercise interventions in PFS (6-9), the results remain equivocal. The purpose of the current study was to perform a meta-analysis to determine the efficacy of knee strengthening with or without hip strengthening in improving strength and decreasing pain in patients with patellofemoral pain.

Pertinent Results:

Literature Search Results:

- 14 studies were included in the systematic review and meta-analysis
- A total of 673 participants were included across all eligible studies
- The mean age of participants ranged from 21 to 35 years.

Effect of Hip and Knee Strengthening:

• In 2 trials, hip and knee strengthening did not significantly change knee muscle strength compared with placebo.

- In 3 trials, knee pain was significantly decreased following hip and knee strengthening exercises, a finding that was maintained 1-year after initiation of exercise.
- In 3 trials, activity level significantly increased (effect size, ES: 1.4) following hip and knee strengthening exercises.

Effect of Hip and Knee Strengthening Compared to Knee Strengthening Alone:

- In 6 trials, combined hip and knee strengthening did not significantly increase knee strength when compared with knee strengthening exercises alone at both 4- and 6- week follow-up intervals.
- In 10 trials, hip and knee strengthening lowered knee pain to a significantly greater degree than knee strengthening alone, a finding that was maintained at 12-weeks of follow-up.
- In 8 trials, hip and knee strengthening improved activity level (ES: 0.7) to a significantly greater degree than knee strengthening alone. This finding was maintained at 12-week follow-up.

CLINICAL APPLICATION & CONCLUSIONS

The authors conclude that hip and knee strengthening in combination is not only effective, but superior to relying on knee strengthening alone when addressing pain and disability associated with PFS – the effects on strength are similar, but the combined approach improves pain and function to a greater degree. They also noted that these findings were maintained beyond the study period. Based on the 14 studies included in the review, a program of hip and knee strengthening 3 times per week for a period of 6 weeks should be sufficient to significantly reduce pain and increase strength and activity levels in patients suffering from PFS.

EDITOR'S NOTE: This is yet another example from the literature as a whole (via systematic review and meta-analysis) supporting the notion of rehabilitating the entire kinetic chain (or person) when addressing a local complaint such as PFS. Hip function (including strength, mobility and motor control) is extremely important for normal knee function as well as lumbopelvic kinematics and force transmission. This concept could also be extended to those with chronic ankle injuries or instability...treat and train the entire person.

STUDY METHODS

A comprehensive search strategy following the Cochrane Collaboration guidelines was used to identify randomized, clinical trials comparing hip and knee strengthening programs with those that focused on knee strengthening alone. All relevant databases (CINAHL, EMBASE, MEDLINE, etc.) were searched. Search terms included: words related to patellofemoral pain and randomized, quasi-randomized, or controlled trials, and words related to strength training. Eligible studies were assessed for quality using the PEDro scale for methodological quality in randomized trials. Outcomes relating to muscle strength, pain level and disability (activity level) were set *a priori*. Data was meta-analysed using Review Manager 5.3.

STUDY STRENGTHS/WEAKNESSES

Strengths:

- A comprehensive search strategy was utilized.
- Study characteristics and strength (via PEDro score) were included in the eligibility analysis.
- Interventions were sufficiently broad to maximize study inclusion but were homogenous enough to allow for pooling of data for the meta-analysis.
- Tests for heterogeneity were used as well as appropriate use of mixed and random effects models.

Weaknesses:

• 14 trials involving 673 patients were included, suggesting that the included trials each had a relatively low sample size (< 50 patients, intervention plus control). Larger trials would be helpful and allow for firmer conclusions to be made.

Additional References:

- 1. van Middelkoop M, van Linschoten R, Berger MY, Koes BW, Bierma-Zeinstra SM. Knee complaints seen in general practice: active sport participants versus non-sport participants. BMC Musculoskelet Disord 2008; 9: 36.
- 2. Nimon G, Murray D, Sandow M, Goodfellow J. Natural history of anterior knee pain: a 14- to 20-year follow-up of nonoperative management. J Pediatr Orthop 1998; 18: 118-122.

- 3. Boling MC, Padua DA, Marshall SW, Guskiewicz K, Pyne S, Beutler A. A prospective investigation of biomechanical risk factors for patellofemoral pain syndrome: the Joint Undertaking to Monitor and Prevent ACL Injury (JUMP-ACL) cohort. Am J Sports Med. 2009; 37: 2108-2116.
- 4. Chiu JK, Wong YM, Yung PS, Ng GY. The effects of quadriceps strengthening on pain, function, and patellofemoral joint contact area in persons with patellofemoral pain. Am J Phys Med Rehabil 2012; 91: 98-106.
- 5. Prins MR, van der Wurff P. Females with patellofemoral pain syndrome have weak hip muscles: a systematic review. Aust J Physiother 2009; 55: 9-15.
- 6. Bolgla LA, Boling MC. An update for the conservative management of patellofemoral pain syndrome: a systematic review of the literature from 2000 to 2010. Int J Sports Phys Ther 2011; 6: 112-125.
- 7. Regelski CL, Ford BL, Hoch MC. Hip strengthening compared with quadriceps strengthening in conservative treatment of patients with patellofemoral pain: a critically appraised topic. Int J Athl Ther Train 2015; 20: 4-12.
- 8. Santos TR, Oliveira BA, Ocarino JM, Holt KG, Fonseca ST. Effectiveness of hip muscle strengthening in patellofemoral pain syndrome patients: a systematic review. Braz J Phys Ther 2015; 19: 167-176.
- 9. van der Heijden RA, Lankhorst NE, van Linschoten R, Bierma-Zeinstra SM, van Middelkoop M. Exercise for treating patellofemoral pain syndrome. Cochrane Database Syst Rev 2015; 1: CD010387.