OKLAHOMA STATE UNIVERSITY

Posterolateral Hip Muscle Strengthening in Decreasing Symptoms of Patellofemoral Pain Syndrome: A Critically Appraised Topic

CENTER FOR HEALTH SCIENCES
OKLAHOMA STATE UNIVERSITY

Kristi Van Boskerck, ATS, Daniel Dopson, ATS, Aric Warren, PhD, LAT, ATC, CSCS, CES

Department of Athletic Training

INTRODUCTION

Patellofemoral pain syndrome (PFPS) is one of the most common problems among physically active individuals between the ages of 15 and 30.[1] Dye et al[2] characterized PFPS as the "black hole of orthopedics" because of its poorly Identified causative factors. This theory has led to the identification of factors that can lead to increased patellofemoral joint loading, such as (1) altered lower extremity kinematics and kinetics, (2) decreased muscle strength and neuromuscular recruitment, (3) faulty structural alignment, and (4) reduced flexibility.[3] It is also one of the most common overuse injuries among different sports disciplines such as basketball, volleyball, and running, and a prevalence rate of between 13% and 26% is reported in females participating in soccer, volleyball, running, fencing and rock climbing.[4] PFPS has been reported to account for 19.6% of all injuries in females and 7.4% of all injuries in males.[1] Weakness associated in the hip musculature can be associated with poor patellar tracking on the tibiofemoral joint, causing the onset of pain due to irritation of these articular surfaces. Evidence is inconclusive in regard to whether posterolateral hip strengthening exercises are superior to quadriceps strengthening exercises when treating patients with PFPS.

FOCUSED CLINICAL QUESTION

Does posterolateral hip strengthening compared to quadriceps strengthening exercises improve symptoms of pain and strength in individuals with patellofemoral pain syndrome?

SEARCH STRATEGY

A computerized web search was conducted in November 2019.

Databases Used:
Pubmed, SPORTDiscus, EBSCO host, Trip Research, Google Scholar

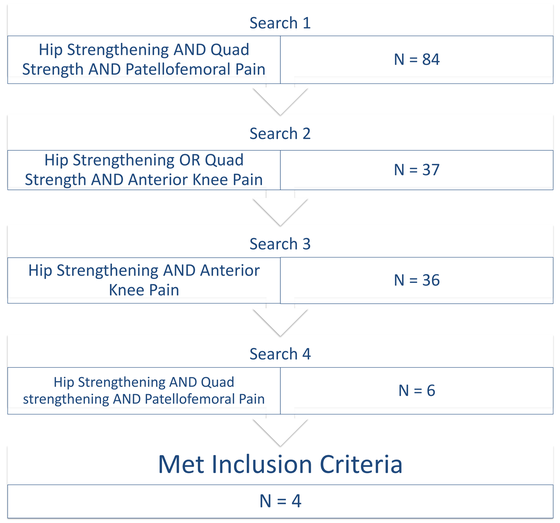
Inclusion Criteria:
Available in the English Language, articles that are peer-reviewed RCTs/SR, patients presenting with patellofemoral pain between the ages of 18 and 45, published prior to November 2009, studies that compared the hip and quad strengthening exercises, studies that used patient oriented outcome measures, and studies done on live human subjects

Exclusion Criteria:
Addition of hip exercises instead of comparing the two, no presence of patellofemoral pain syndrome, research not published prior to November 2009, presence of underlying knee pathologies, animal studies, studies that did not have outcomes related to patellofemoral pain syndrome

RESULTS

Results of Search Strategy

Results of Search: Four articles[5-8] were found that met the inclusion/exclusion criteria for the clinical question. Three of the articles are randomized controlled trials[5,6,7] and one is a comparative control trial[8].



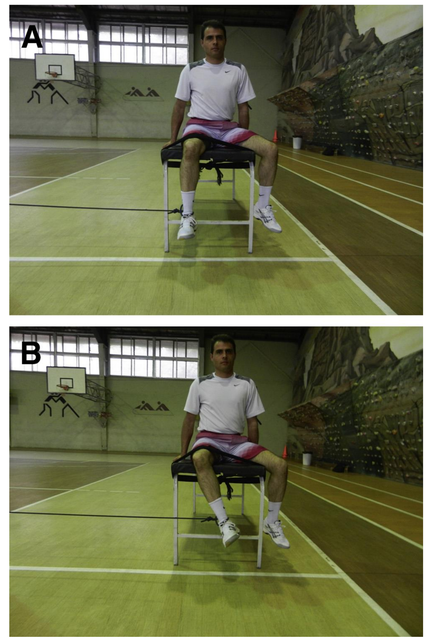
CONCLUSION

Based on the studies included in this analysis, there are positive patient-oriented outcomes in the reduction of PFPS with posterolateral hip strengthening. There is moderate evidence that shows decrease in symptoms of pain in patients presenting with PFPS that participated in posterolateral hip strengthening compared to thigh musculature training alone.

Summary of Evidence Table

	Ferber et al[5]	Hott et al[7]	Camargo Saad et al.[6]	Khayambashi et al[8]
Patient Population/ Demographics	199 (27.6%) met the inclusion criteria (66 men, 133 women, age = 29.0 ± 7.1 years, height = 170.4 ± 9.4cm, weight = 67.6 ± 13.5kg)	112 patients between the ages of 16-40 years old and had a symptom duration >3 months with a clinical diagnosis of PFPS	Forty recreational female athletes between the ages of 18-23 with PFPS	Thirty-six patients met the study inclusion criteria (18 men, 18 women)
Study Design	Randomized control trial	Randomized Controlled Trial	Randomized Controlled Trial	Comparative Control Trial
Level of Evidence/ Validity Score	Level 1 PEDro: 8/10	Level 1 PEDro: 8/10	Level 1b PEDro: 8/10	Level 2 PEDro: 7/10
Intervention	Patients with PFP were randomly assigned to receive 1 of 2 treatment protocols (HIP or KNEE). No placebo or control groups were used in this study. However, the KNEE protocol served as the "gold standard" rehabilitation program because it was deemed to be the most widely used and considered the standard of care protocol for PFP. For rehabilitation progression, each patient with PFP visited the AT up to 3 times/wk during the 6-week period. The At asked all patients with PFP to perform their prescribed exercises a minimum of 6d/wk for 6 wks.	Participants were randomized to a 6-week intervention consisting of patient education combined with isolated hip-focused exercise (n=39), traditional knee-focused exercise (n=37), or free physical activity (n=36). Three sessions per week were performed for 6 weeks: 1 under supervision of the physiotherapist and 2 home sessions, with at least 1 day between sessions. Initial dosage was 3 sets of 10 repetitions for each exercise, with a progression to 3 x 20 reps	4 different groups that participants were randomized into; Quad strengthening group, hip strengthening group, stretching group, and control group. Patients included in the treatment groups participated in two sessions per week for eight weeks with a minimum break of 24 hours between sessions. Each treatment session was approximately 50 minutes in duration with a PT	The quad group consisted of terminal knee extensions and mini squats with squeezing a medball between the knees. The hip group consisted of abductor banded exercises and banded external rotation exercises. Study participants completed exercises supervised by a physical therapist 3 times per week for 8 weeks. Each session consisted of 5 minutes of warm-up, 20 minutes of directed exercise, and 5 minutes of cool-down. Patients were allowed to take NSAIDs but could not take them 24hrs prior to treatment sessions.
Outcome Measures	Primary Variables: Visual Analog Scale (VAS; maximum score = 10cm), Anterior Knee Pain Scale (AKPS; maximum score = 100), conducted weekly. Secondary Variables were muscle strength and core endurance measured at baseline and at 6weeks.	Primary outcome variable is the anterior knee pain scale (AKPS; maximum score 100; MCID is 10). Secondary outcome variables included the Visual Analog Scale (maximum score 10), Tampa Scale for Kinesiophobia (max score 52), Knee Self-Efficacy Scale (max score 10), EuroQol-5 Dimensions -5 Level, Danish validated index value calculator, Eur-Qol-Visual Analog scale (max score 100), Step down test for functional testing and isometric strength was measured with a force sensor; performed at 6 weeks	Primary Variables: Visual Analog Scale (VAS; max score 10), Anterior Knee Pain Scale (AKPS; max score 100), Secondary Variables: isometric strength of the hip and knee, knee kinematics performed by a three-step stair maneuver	Primary Variables: Visual Analog Scale (VAS; max score 10), Secondary Variable: Western Ontario McMaster Universities Osteoarthritis Index (WOMAC max score 96). Outcome measures were obtained on 3 separate occasions: at baseline, after 8 weeks of exercise, and at 6 months (follow-up).
Result Key Findings	Of the 199 patients with PFP, 157 patients (78.9%) reported treatment success and resolution of symptoms based on our priori definition, and 42 (21.1% were unsuccessful. Specifically, 89 of the 111 patients (80.2%) involved in the HIP protocol were successful and 68 of the 88 patients (77%) involved in the KNEE protocol were successful. For patients involved in either the HIP or KNEE rehabilitation protocols, HABD ($F_{1,199}$= 23.19, P < .001), hip external rotator ($F_{1,199}$= 15.27, P < .001), Hip internal rotator ($F_{1,199}$= 8.42, P < .001), hip extensor ($F_{1,199}$= 20.04, P < .001), and knee extensor ($F_{1,199}$= 14.39, P < .001) strength significantly increased after the 6-week intervention. However post hoc analysis revealed that those patients involved in the HIP protocol exhibited greater changes in HABD (P= .01) and hip extensor (P = .01) strength than did those involved in the KNEE protocol.	At 3 months, there were no between group differences in the AKPS (P = .90). Paired-samples t test demonstrated an improvement in AKPS at 3 months for the group as a whole, from 65.9 to 73.5 (mean difference, 7.6; 95% CI, 5.6-9.6; P < .001)	For between-group functional questionnaire scores pre and post-treatment, all groups except the control group improved their scores (p < 0.01). All treatment groups had significant MCID for pain outcomes at the end of 8 week exercise program, except the control group. The post-treatment period revealed strength improvement for the hip and quad group. The hip group also showed improvement with post-treatment step-up kinematics versus the other treatment groups. Treatment groups only appeared to be clinically relevant when compared to the control group and not against other treatment groups	Between- group post hoc testing revealed that the VAS scores were lower in the posterolateral hip exercise group than the quadriceps exercise group post intervention (t = 1.823, P = .039) and at 6-month follow up (t= 2.80, P > .004) Between-group post hoc testing revealed that the WOMAC scores were lower in the posterolateral hip exercise group than the quadriceps exercise group post intervention (t = 3.91, P < .001) and at 6-month follow up (t= 4.51, P < .001)

Isolated Hip Banded Internal and External Rotation Exercise



Khayambashi K, Fallah A, et al. Posterolateral Hip Muscle Strengthening Versus Quadriceps Strengthening for Patellofemoral Pain: A Comparative Control Trial. ACRM. 2014; 95:900-907.

STRENGTH OF RECOMMENDATION

The available evidence received a Level B, based on the Strength of Recommendation Taxonomy (SORT) analysis due to limited controlled research outcomes.

REFERENCES

1. Boling M, Padua D, et al. Gender differences in the incidence and prevalence of patellofemoral pain syndrome. *Scandalizes J Med Sci Sports.* 2010; 20: 725-730.
2. Dye SF, Staubli HU, et al. The mosaic of pathophysiology causing patellofemoral pain: therapeutic implications. *Oper Techniq Sports Med.* 1999;7(2):46-54
3. Bolgla LA, Boling MC, et al. National Athletic Trainers' Association Position Statement: Management of Individuals with Patellofemoral Pain. *J Athl Train.* 2019; 53(9): 820-836.
4. Halabchi F, Abolhasani M, et al. Patellofemoral pain in athletes: clinical perspectives. *DovePress.* 2017:8: 189-203.
5. Ferber R, Bolgla L, et al. Strengthening of the Hip and Core Versus Knee Muscles for the Treatment of Patellofemoral Pain: A Multicenter Randomized Controlled Trial. *J Athl Train.* 2015; 50(4): 366-377.
6. Camargo Saad M, Antunes de Vasconcelos R, et al. Is hip strengthening the best treatment option for females with patellofemoral pain? A randomized controlled trial of three different types of exercises. *Br J Phys Ther.* 2018; 22(5): 408-416.
7. Hott A, Brox JI, et al. Effectiveness of Isolated Hip Exercise, Knee Exercise, or Free Physical Activity for Patellofemoral Pain. *Amer J Sports Med.* 2019;47(6):1312-1322.
8. Khayambashi K, Fallah A, et al. Posterolateral Hip Muscle Strengthening Versus Quadriceps Strengthening for Patellofemoral Pain: A Comparative Control Trial. *Amer Cong Rehab Med.* 2014; 95:900-907.
9. Witvrouw E, Callaghan MJ, et al. Patellofemoral pain: consensus statement from the 3rd International Patellofemoral Pain Research Retreat held in Vancouver, September 2013. *Br J Sports Med.* 2014;48:411-414.