

Hip and Knee versus Knee-Focused Exercise for Patellofemoral Pain Syndrome: A Randomised Comparison

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ABSTRACT

Patellofemoral pain syndrome is a common cause of anterior knee pain, and exercise therapy is the mainstay of management. Whether the addition of hip-focused exercise to knee exercise improves outcomes is of clinical interest. This paper reports a randomised comparison of hip-and-knee versus knee-focused exercise for patellofemoral pain syndrome. Seventy-eight patients were randomised to a combined hip-and-knee exercise programme or a knee-focused exercise programme over eight weeks, and pain and function were assessed. The hip-and-knee group achieved greater reductions in pain and greater improvements in function and global improvement than the knee-focused group, with a greater reduction in pain over the programme. Both programmes were safe and well tolerated. These findings indicate that adding hip-focused exercise to knee exercise improves outcomes in patellofemoral pain syndrome, supporting the inclusion of hip strengthening in musculoskeletal physiotherapy management. The single-centre design and short duration indicate areas for further investigation.

KEYWORDS: *Patellofemoral Pain, Exercise Therapy, Hip Strengthening, Musculoskeletal Physiotherapy, Anterior Knee Pain, Function, Rehabilitation, Randomised Comparison*

INTRODUCTION

It can interfere with sport, work and routine activities, and a substantial proportion of patients experience persistent or recurrent symptoms, underlining the need for effective management [1], [2].

Patellofemoral pain syndrome is one of the most common causes of anterior knee pain,

particularly in active and younger individuals, and is characterised by pain around or behind the patella that is aggravated by activities loading the patellofemoral joint, such as stair climbing, squatting and running [1]. It can be persistent and recurrent, affecting activity and quality of life, and is a frequent reason for seeking musculoskeletal care [1], [2]. Management is predominantly conservative, with exercise therapy as the mainstay.

Quadriceps strengthening, particularly of the vastus medialis, was long emphasised on the basis of its role in patellar tracking, and it remains a component of most programmes [2], [3].

Exercise therapy is strongly supported for patellofemoral pain syndrome, and traditionally focused on strengthening the knee extensor muscles, particularly the quadriceps [2], [3]. More recently, attention has turned to the role of the hip musculature, as weakness and impaired control of the hip abductors and external rotators may contribute to abnormal lower-limb mechanics and patellofemoral loading [3]. This has prompted interest in incorporating hip-focused exercise into rehabilitation programmes.

In this way, hip-focused exercise complements knee exercise by acting on the lower limb above the knee, addressing factors that contribute to patellofemoral loading [2], [3].

The rationale for hip-focused exercise rests on the influence of proximal hip control on lower-limb alignment and patellofemoral joint loading [2], [3]. Strengthening the hip abductors and external rotators may improve control of the lower limb, reduce abnormal mechanics and decrease patellofemoral stress, thereby relieving pain and improving function. Combined hip-and-knee programmes aim to address both proximal and local factors, whereas traditional knee-focused programmes target the quadriceps alone.

Although both knee and hip exercise are used, the additional benefit of incorporating hip-focused exercise over knee exercise alone is of clinical interest and continued evaluation. The problem addressed in this study is the need for controlled evidence comparing hip-and-knee with knee-focused exercise in patellofemoral pain syndrome. Accordingly, this randomised comparison evaluates the two approaches, assessing pain and function over eight weeks, with the aim of informing musculoskeletal physiotherapy practice.

LITERATURE REVIEW

The accumulation of evidence on the role of proximal factors has been a notable development, broadening the focus of rehabilitation beyond the knee itself [2], [3].

Patellofemoral pain syndrome has been extensively studied, and exercise therapy is consistently recommended as the core treatment [2], [3]. Systematic reviews and consensus statements support exercise for reducing pain and improving function, and increasingly recommend the inclusion of hip-focused exercise alongside knee exercise [3]. This reflects growing evidence on the contribution of proximal factors to the condition.

Traditional rehabilitation focused on quadriceps strengthening, addressing the local muscular factors at the knee [2], [3]. The recognition that hip muscle weakness and impaired control may contribute to abnormal lower-limb mechanics and patellofemoral loading has expanded the focus to include the hip [3]. Studies comparing hip-and-knee with knee-focused exercise have generally reported that the addition of hip exercise improves outcomes, particularly pain and function, although findings and effect sizes vary [3], [4].

The mechanisms underlying the benefit of hip-focused exercise include improved control of lower-limb alignment and reduced patellofemoral loading, in addition to the local effects of knee exercise [2], [3]. Validated outcome measures, including pain scales and the Anterior Knee Pain Scale, enable assessment of these benefits [5]. While the inclusion of hip exercise is increasingly supported, controlled comparisons of hip-and-knee with knee-focused exercise continue to inform practice, which is the focus of the present study.

The visual analogue scale and the Anterior Knee Pain Scale are validated measures capturing pain intensity and knee-specific function, the outcomes most relevant to patellofemoral pain syndrome [5]. Assessing both allows the effect of the two exercise programmes to be compared in terms of pain relief and functional improvement, which may not always move in parallel.

RESEARCH GAP

Although exercise therapy for patellofemoral pain syndrome is well supported, and hip-focused exercise is increasingly recommended, controlled comparisons directly evaluating the additional benefit of combined hip-and-knee exercise over knee-focused exercise alone, using

validated pain and function outcomes, remain valuable. Much of the literature evaluates exercise broadly or focuses on knee exercise. This study addresses that gap through a randomised comparison of hip-and-knee with knee-focused exercise over an eight-week programme.

OBJECTIVES

The objectives of the study were as follows:

- To compare pain reduction between hip-and-knee and knee-focused exercise in patellofemoral pain syndrome.
- To compare functional outcomes between the two programmes.
- To evaluate global improvement and the trajectory of pain over the programme.
- To inform the inclusion of hip-focused exercise in musculoskeletal physiotherapy practice.

METHODOLOGY

Study Design and Participants

A randomised comparison was conducted in adults with patellofemoral pain syndrome diagnosed on standard clinical criteria. Patients with other knee pathology, recent surgery or contraindications to exercise were excluded. Of 90 patients assessed, 78 were randomised in equal numbers to hip-and-knee or knee-focused exercise with informed consent. The study followed accepted ethical standards. Baseline characteristics are summarised in Table 1, and the study flow is shown in Figure 1.

Interventions

Keeping the programmes equivalent in all respects except the hip component was important for isolating the specific effect of hip-focused exercise [3], [4].

Both groups undertook an eight-week supervised exercise programme of equivalent frequency and duration. The hip-and-knee group performed strengthening of the hip abductors and external rotators in addition to quadriceps and knee exercise, while the knee-focused group performed quadriceps and knee exercise alone [2], [3]. Both were supported by a home programme. The intervention components are summarised in Table 2.

Outcome Measures

Pain was assessed using a visual analogue scale, and function using the Anterior Knee Pain Scale, with global improvement assessed at eight weeks [5]. Assessments were performed by raters blinded to group allocation, following standardised procedures.

Statistical Analysis

Pain and function outcomes were compared between groups, and the trajectory of pain over the programme was examined. Results are presented in Table 3, with outcomes shown in Figure 2 and the pain trajectory in Figure 3.

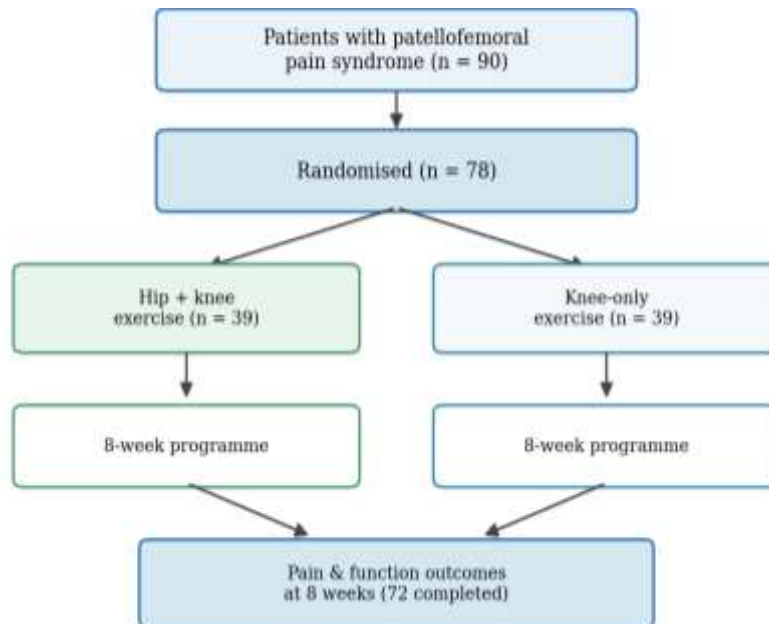


Figure 1: Flow of participants through randomisation, intervention and assessment.

Table 1: Baseline Characteristics of Participants (N = 78)

Characteristic	Value	Notes
Mean age (years)	27.4 ± 6.8	Range 18-42
Female / Male	47 / 31	60% female
Mean duration (months)	9.2 ± 4.6	
Mean baseline VAS	6.5 ± 1.2	0-10 scale
Hip-and-knee / knee-focused	39 / 39	Randomised

Table 2: Components of the two exercise programmes.

Element	Hip-and-knee	Knee-focused
Knee exercise	Quadriceps strengthening	Quadriceps strengthening
Hip exercise	Abductor / rotator strengthening	Not included
Functional exercise	Included	Included
Home programme	Supported	Supported

RESULTS AND FINDINGS

The high completion rate in both groups indicates that the programmes were acceptable and feasible to follow [3], [4].

Of 78 randomised patients, 72 (92%) completed the eight-week programme and assessments. The hip-and-knee group achieved better outcomes than the knee-focused group, as shown in Figure 2.

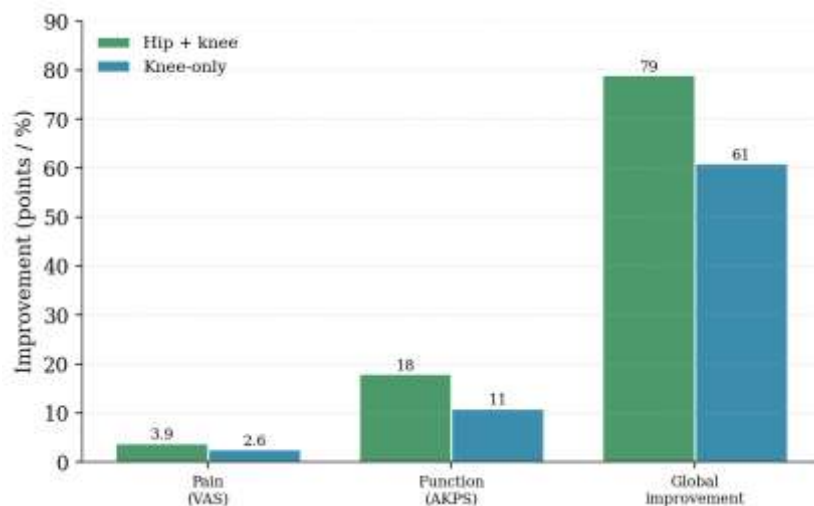


Figure 2: Pain, Function and Global Improvement at Eight Weeks by Group

Because the two programmes were matched for frequency, duration and the knee exercises performed, the additional benefit can reasonably be attributed to the inclusion of hip-focused exercise [3], [4].

Reductions in pain and improvements in function on the Anterior Knee Pain Scale were greater in the hip-and-knee group than in the knee-focused group, and a higher proportion of patients reported global improvement. These differences indicate that the addition of hip-focused exercise improved outcomes, consistent with the contribution of proximal hip control to lower-limb mechanics and patellofemoral loading [2], [3]. Both groups improved from baseline, confirming that both programmes were beneficial.

The trajectory of pain over the programme also favoured the hip-and-knee group (Figure 3). Pain decreased progressively in both groups, but the reduction was greater in the hip-and-knee group, with the difference increasing over the eight weeks. This progressive divergence reflects the additional benefit of hip-focused exercise accruing over the programme [3], [4]. The greater pain reduction in the hip-and-knee group is consistent with the addressing of both proximal and local factors.

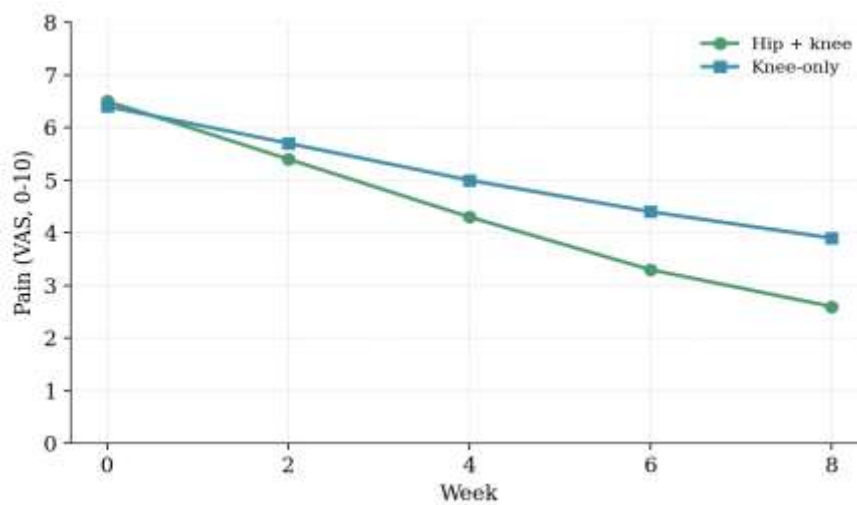


Figure 3: Pain (Visual Analogue Scale) Over the Eight-Week Programme by Group.

That both programmes were safe, well tolerated and associated with good adherence supports the feasibility of adding hip-focused exercise without compromising acceptability [2], [3].

Overall, the hip-and-knee programme was associated with greater reductions in pain and greater improvements in function and global improvement than the knee-focused programme. Both programmes were safe and well tolerated, with good adherence and no serious adverse events. Aggregate outcomes are summarised in Table 3.

Table 3: Pain and Function Outcomes by Group

Outcome	Hip+knee	Knee	Difference
VAS reduction	3.9	2.6	+1.3
AKPS improvement	18	11	+7
Global improvement	79%	61%	+18
Adherence	87%	85%	

DISCUSSION

This randomised comparison found that adding hip-focused exercise to knee exercise produced greater reductions in pain and greater improvements in function and global improvement than knee-focused exercise alone in patients with patellofemoral pain syndrome. These findings support the inclusion of hip strengthening in musculoskeletal physiotherapy management of the condition and are consistent with the growing evidence on the role of proximal factors [2], [3].

Several studies have reported hip muscle weakness in people with patellofemoral pain, providing a rationale for targeting these muscles in rehabilitation [2], [3].

The greater benefit of the hip-and-knee programme is mechanistically coherent [2], [3]. Weakness and impaired control of the hip abductors and external rotators may contribute to abnormal lower-limb alignment and increased patellofemoral loading, and strengthening these muscles improves proximal control and reduces patellofemoral stress, in addition to the local effects of knee exercise. By addressing both proximal and local factors, the combined programme targets the condition more comprehensively, which likely underlies its superior outcomes. The progressive divergence in pain reduction supports a genuine additional effect of hip exercise.

This supports a comprehensive approach in which proximal and local factors are addressed together, rather than a choice between hip and knee exercise [3], [4].

The finding that both programmes improved outcomes, while the hip-and-knee programme achieved greater benefit, indicates that hip exercise enhances rather than replaces knee exercise

[3], [4]. This supports a comprehensive approach that includes both hip and knee strengthening rather than focusing on the knee alone. The clinical significance lies in the demonstration that incorporating hip-focused exercise improves outcomes in patellofemoral pain syndrome, providing a simple and practical means of enhancing a core rehabilitation programme, with potential benefits for pain, function and recurrence.

The biomechanical rationale for hip-focused exercise is well established, since control of hip adduction and internal rotation influences the alignment of the lower limb and the tracking of the patella, and weakness of the hip muscles can contribute to maltracking and increased patellofemoral stress [2], [3]. Strengthening these proximal muscles therefore addresses a mechanism that knee-focused exercise alone does not target.

The progressive divergence in pain between the groups over the eight weeks is consistent with the additional benefit of hip exercise accumulating as proximal strength and control improve, rather than appearing immediately [3], [4]. This pattern supports a genuine, exercise-related effect rather than a transient difference.

Certain limitations should be acknowledged. The single-centre design and eight-week duration limit generalisability and do not establish the durability of the benefits, which is relevant given the recurrent nature of the condition. While outcome assessors were blinded, patients and treating therapists could not be blinded, allowing potential expectation effects. These considerations indicate the need for larger, longer studies, but the findings provide useful controlled evidence supporting the inclusion of hip-focused exercise.

LIMITATIONS

This study has several limitations. The single-centre design and eight-week duration limit generalisability and preclude assessment of the durability of benefits, which is important given the recurrent nature of patellofemoral pain syndrome. Although outcome assessors were blinded, patients and treating therapists could not be blinded to the interventions, allowing potential performance and expectation effects. The diagnosis was based on clinical criteria, and the cohort comprised predominantly younger, active individuals, which may limit applicability to other groups. Pain and function were the primary outcomes, with broader activity and quality-of-life measures not the main focus.

FUTURE SCOPE

Longer-term studies are particularly important given the tendency of patellofemoral pain to recur, since durability of benefit and prevention of recurrence are key clinical concerns [1], [2]. Future research should include larger, multicentre randomised trials with longer follow-up to confirm the durability of the benefits of adding hip-focused exercise in patellofemoral pain syndrome and to evaluate effects on recurrence and return to activity. Studies clarifying the optimal content, intensity and progression of hip and knee exercise, and identifying which patients benefit most from hip-focused exercise, would help individualise treatment. Research into the integration of exercise with other interventions, and into home- and technology-supported delivery, would further inform practice. Evaluation of activity, sport and quality-of-life outcomes, alongside pain and function, would strengthen the evidence base for musculoskeletal physiotherapy in patellofemoral pain syndrome.

CONCLUSION

These findings are consistent with consensus recommendations that increasingly advocate the inclusion of hip-focused exercise in the management of patellofemoral pain syndrome [2], [3]. Adding hip-focused exercise is a simple, low-cost modification to a standard programme, making it a practical way to enhance outcomes in routine practice [3], [4].

In this randomised comparison, adding hip-focused exercise to knee exercise produced greater reductions in pain and greater improvements in function and global improvement than knee-focused exercise alone in patients with patellofemoral pain syndrome, with progressive benefit over the programme. The findings support the inclusion of hip strengthening, alongside knee exercise, in musculoskeletal physiotherapy management of the condition. While the single-centre design and short duration warrant cautious interpretation, the consistent advantages observed support a combined hip-and-knee approach, and larger trials with longer follow-up are needed to confirm the durability of these outcomes and their effect on recurrence.

REFERENCES

1. Crossley KM, Stefanik JJ, Selfe J, et al. 2016 Patellofemoral pain consensus statement. *British Journal of Sports Medicine*. 2016;50(14):839-843.
2. Collins NJ, Barton CJ, van Middelkoop M, et al. 2018 consensus statement on exercise therapy and physical interventions for patellofemoral pain. *British Journal of Sports*

- Medicine. 2018;52(18):1170-1178.
3. Lack S, Barton C, Sohan O, et al. Proximal versus distal control of the lower limb in patellofemoral pain: a systematic review and meta-analysis. British Journal of Sports Medicine. 2015;49(21):1365-1376.
 4. Nascimento LR, Teixeira-Salmela LF, Souza RB, Resende RA. Hip and knee strengthening is more effective than knee strengthening alone for reducing pain and improving activity in patellofemoral pain: a systematic review and meta-analysis. Journal of Orthopaedic and Sports Physical Therapy. 2018;48(1):19-31.
 5. Kujala UM, Jaakkola LH, Koskinen SK, et al. Scoring of patellofemoral disorders. Arthroscopy. 1993;9(2):159-163.

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