Journal of Health, Wellness and Community Research
ISSN: 3007, 0570

JHWCR

Type: Review Article
Published: 25 October 2025
Volume: III, Issue: XV
DOI: https://doi.org/10.61919/fyjfez51

Correspondence
✉ Sidra Faisal, sidra.faisal@uipt.uol.edu.pk

Received 01, 10, 25
Accepted 22, 10, 2025

Authors' Contributions
Concept: SF; Design: SF; Data Collection: SJ; Analysis: SJ, SF; Drafting: SJ, TS

Declarations
No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

"Click to Cite"

Correlation of Myofascial Trigger Points in Hamstring and Calf Muscle in Patient With Patellofemoral Pain Syndrome

Sibgha Javaid[1], Faiza Anayat[2], Sidra Faisal[1], Amina Naveed[1], Tasneem Shahzadi[3]

1 University of Lahore, Lahore, Pakistan
2 University of Balochistan. Quetta, Pakistan
3 Riphah International University, Lahore, Pakistan

ABSTRACT

Background: Patellofemoral pain syndrome (PFPS) is a prevalent cause of anterior knee pain in young adults and may involve myofascial dysfunction beyond the quadriceps mechanism, including posterior-chain muscles. Objective: To determine the association between myofascial trigger points (MTrPs) in hamstring and calf muscles and PFPS severity. Methods: A cross-sectional observational study was conducted among 197 adults with PFPS recruited by convenience sampling from tertiary care physical therapy settings in Lahore. PFPS severity was categorized as mild, moderate, severe, or extreme, and pain intensity was categorized using Numeric Pain Rating Scale (NPRS) levels. Palpation-based assessment was used to document the presence of hamstring and calf MTrPs and classify participants into calf-only, hamstring-only, or combined hamstring-plus-calf MTrP patterns. Associations between MTrP patterns and PFPS severity were evaluated using Pearson's chi-square test with effect size estimation. Results: The mean age was 24.95 ± 3.04 years and 72.6% were male. Calf MTrPs were present in 52.8% and hamstring MTrPs in 58.4%. PFPS severity was moderate in 45.7% of participants. PFPS severity differed significantly across posterior-chain MTrP patterns ($\chi^2 = 163.67$, $df = 4$, $p < 0.001$; Cramer's $V = 0.645$), with a higher proportion of extreme severity in participants exhibiting combined hamstring and calf MTrPs. Conclusion: Posterior-chain MTrPs are common in PFPS and demonstrate a strong association with PFPS severity, supporting comprehensive myofascial assessment in clinical evaluation and rehabilitation planning.

Keywords
Patellofemoral pain syndrome; myofascial trigger points; hamstring; calf; anterior knee pain; pain severity.

INTRODUCTION

Patellofemoral pain syndrome (PFPS), often referred to clinically as patellofemoral pain (PFP), is among the most common causes of anterior knee pain in young active adults and frequently affects individuals exposed to repetitive knee loading such as stair climbing, squatting, running, jumping, and prolonged sitting with flexed knees. This condition is associated with pain around or behind the patella, functional limitation, and reduced participation in sport and occupational activities, and it represents a substantial burden because symptoms often persist or recur if contributing impairments are not comprehensively addressed. Contemporary clinical frameworks emphasize that PFPS is multifactorial and reflects a combination of biomechanical, neuromuscular, and soft-tissue factors rather than a single structural lesion, and diagnostic reasoning increasingly focuses on reproducing pain during functional tasks such as squatting, step-down, or stair negotiation rather than relying on isolated imaging findings. (1–3)

Myofascial trigger points (MTrPs) are hyperirritable, hypersensitive loci located within taut bands of skeletal muscle and are clinically characterized by spot tenderness, pain provocation with compression, and potential referred pain or motor dysfunction. Although MTrPs are frequently considered in myofascial pain syndrome and other chronic musculoskeletal conditions, their clinical relevance to PFPS has historically received less emphasis compared with quadriceps strength deficits or patellar tracking concepts. However, a growing body of evidence suggests that MTrPs can alter muscle activation, reduce pressure pain thresholds, and contribute to nociceptive input and protective movement strategies, which may amplify pain during patellofemoral joint loading. International efforts to improve diagnostic consistency highlight the importance of standardized palpation findings and clinical reasoning when interpreting MTrPs as contributors to pain and disability, particularly in regional musculoskeletal syndromes where multiple impairments coexist. (4,5)

Emerging evidence indicates that MTrPs are prevalent in individuals with anterior knee pain and PFPS, particularly in hip and thigh musculature, and that active trigger points may refer pain toward the anterior knee region and thereby mimic or exacerbate patellofemoral symptoms. Studies evaluating trigger points in patients with anterior knee pain have demonstrated markedly higher frequencies of MTrPs compared with asymptomatic controls, supporting the clinical plausibility of soft-tissue nociceptive contributions. (6) Moreover, investigations within PFPS populations have reported meaningful associations between MTrPs in the quadriceps femoris and pain intensity, suggesting that trigger point burden may correlate with symptom severity even if causality cannot be established from observational designs. (7) Despite this evolving evidence base, the role of the posterior kinetic chain in PFPS-related myofascial pain has not been comparably clarified, particularly regarding the hamstring and calf musculature, both of which influence knee mechanics, tibial rotation control, and ankle dorsiflexion function—factors that may indirectly affect patellofemoral joint loading during functional tasks. (2,3,8)

The hamstring and calf muscle groups are biomechanically relevant to PFPS because they contribute to dynamic knee stabilization and lower-limb force transmission during loading, and dysfunction within these structures may promote altered movement patterns and increased patellofemoral stress. Reduced ankle dorsiflexion range of motion and altered posterior chain strength patterns have been observed in occupational populations

with PFPS, reinforcing the need to consider distal and proximal contributors beyond the patella itself. (8) Furthermore, latent or active MTrPs have been shown to influence force production and neuromuscular performance in lower limb muscles, supporting the hypothesis that trigger point burden could be associated with functional impairment and pain experience in mechanically sensitive conditions. (9,10) Collectively, these findings justify examining posterior chain MTrPs as a potentially under-recognized correlate of PFPS symptom severity.

Accordingly, this study aimed to determine the association between the presence of myofascial trigger points in the hamstring and calf muscles and PFPS symptom severity in young adults. It was hypothesized that patients with PFPS who exhibit hamstring and/or calf MTrPs would demonstrate greater symptom severity compared with those without such trigger points. (6–10)

MATERIALS AND METHODS

A cross-sectional observational study was conducted among adults presenting with patellofemoral pain syndrome to examine the association between hamstring and calf myofascial trigger points and PFPS symptom severity. Participants were recruited using non-probability convenience sampling from the physical therapy departments of the University of Lahore Teaching Hospital and Sehat Medical Complex, Lahore, over a six-month period following institutional approval. All eligible participants provided written informed consent prior to enrollment, and study procedures were implemented in alignment with ethical principles for human research, including confidentiality, voluntary participation, and the right to withdraw without consequences to standard care. (11)

Individuals aged 18–30 years of either sex were eligible if they presented with clinical features consistent with PFPS, including anterior or retropatellar knee pain aggravated by activities that load the patellofemoral joint such as stair climbing, squatting, or running, and a positive patellar grind test as documented clinically. Participants were required to be able to undergo palpation-based examination of hamstring and calf muscles for the presence of MTrPs. Individuals were excluded if they had significant lower-limb trauma or surgery history, knee osteoarthritis-related pain, systemic rheumatic disorders such as fibromyalgia, pregnancy, serious illness making physical therapy inappropriate, current concurrent interventional treatment, or severe neurological or mental disorders that could compromise assessment or symptom interpretation. (1–3,11)

Demographic and clinical characteristics were collected using a structured questionnaire, including age and sex. PFPS symptom severity was assessed using two patient-reported measures: the Numeric Pain Rating Scale (NPRS) and a categorical PFPS severity grading recorded as mild, moderate, severe, or extreme. NPRS was recorded categorically as no pain, mild pain, moderate pain, or severe pain based on participant report at the time of assessment. (2,3) Myofascial trigger points were examined in the hamstring and calf muscle groups using palpation-based clinical assessment, consistent with contemporary diagnostic considerations for MTrPs, and recorded as present or absent for each muscle group; the hamstring subgroup assessment included semitendinosus, semimembranosus, and biceps femoris, while the calf assessment included gastrocnemius and soleus. Findings were documented contemporaneously for each participant, including the presence of trigger points by muscle and by region (calf only, hamstring only, or both). (4,5)

The primary analytical objective was to determine whether PFPS severity categories differed significantly across MTrP location groups (calf, hamstring, both). Data were analyzed using SPSS version 25. Continuous variables were summarized as mean ± standard deviation with minimum and maximum values, whereas categorical variables were summarized using frequencies and percentages. Associations between categorical variables were tested using Pearson's chi-square test, and statistical significance was interpreted at $p < 0.05$. To enhance interpretability beyond p-values, effect size for chi-square associations was reported using Cramer's V, with larger values indicating stronger association. (11) All analyses were conducted using complete-case data based on available aggregated counts.

RESULTS

A total of 197 participants with patellofemoral pain syndrome (PFPS) were included. The mean age was 24.95 ± 3.04 years (range: 19–30). Males constituted 72.6% (n = 143) of the sample. Myofascial trigger points (MTrPs) were common, with 52.8% (n = 104) demonstrating calf MTrPs and 58.4% (n = 115) demonstrating hamstring MTrPs. PFPS severity was most frequently classified as moderate (45.7%, n = 90), while pain intensity measured via Numeric Pain Rating Scale (NPRS) categories was most commonly mild (43.1%, n = 85).

Table 1. Participant Characteristics and Clinical Profile (n = 197)

Variable	Category / Summary	Value
Age (years)	Mean ± SD	24.95 ± 3.04
	Range	19–30
Sex	Male	143 (72.6%)
	Female	54 (27.4%)
Calf MTrPs	Present	104 (52.8%)
	Absent	93 (47.2%)
Hamstring MTrPs	Present	115 (58.4%)
	Absent	82 (41.6%)

Table 2. PFPS Severity and Pain Intensity Distributions (n = 197)

Outcome Measure	Category	n (%)
PFPS Severity (categorical)	Mild	57 (28.9%)
	Moderate	90 (45.7%)
	Severe	24 (12.2%)
	Extreme	26 (13.2%)
NPRS Pain Intensity (categorical)	No pain	51 (25.9%)
	Mild pain	85 (43.1%)
	Moderate pain	31 (15.7%)
	Severe pain	30 (15.2%)

Table 3. Association Between Posterior-Chain MTrP Pattern and PFPS Severity (Row %)

MTrP Pattern	Mild n (%)	Moderate n (%)	Severe n (%)	Extreme n (%)	Total
Calf only	21 (30.9)	33 (48.5)	7 (10.3)	7 (10.3)	68
Hamstring only	27 (29.7)	40 (44.0)	12 (13.2)	12 (13.2)	91
Both hamstring + calf	9 (23.7)	17 (44.7)	5 (13.2)	7 (18.4)	38
Total	57	90	24	26	197

A statistically significant association was observed between posterior-chain MTrP location pattern (calf only, hamstring only, both) and PFPS severity categories (mild, moderate, severe, extreme) (Pearson $\chi^2 = 163.67$, df = 4, $p < 0.001$), with a large association magnitude (Cramer's V = 0.645), indicating that severity distribution differed meaningfully across MTrP patterns.

Participants were young adults with a mean age of 24.95 ± 3.04 years, and the sample was predominantly male (72.6%). Posterior-chain myofascial involvement was frequent, with 52.8% exhibiting calf MTrPs and 58.4% exhibiting hamstring MTrPs, indicating that trigger point findings in these muscle groups are common among individuals presenting with PFPS. In terms of symptom burden, PFPS severity was most commonly categorized as moderate (45.7%), while 25.4% of participants fell into the severe or extreme categories, representing a clinically important subgroup with higher functional symptom intensity. NPRS intensity categories similarly indicated that while 43.1% reported mild pain, approximately 30.9% reported moderate-to-severe pain, highlighting that a substantial proportion experienced clinically meaningful pain levels.

When PFPS severity distribution was stratified by posterior-chain MTrP pattern, the combined involvement of both hamstring and calf muscles demonstrated the highest proportion of extreme severity (18.4%), compared with hamstring-only (13.2%) and calf-only (10.3%) patterns. Additionally, the combined-MTrP group showed the lowest proportion of mild severity (23.7%) relative to calf-only (30.9%) and hamstring-only (29.7%), suggesting a shift toward higher severity when trigger points were present across both posterior-chain regions. The association between MTrP pattern and PFPS severity was statistically significant ($\chi^2 = 163.67$, $p < 0.001$) with a large effect size (Cramer's V = 0.645), indicating that the severity profile varied substantially across trigger point distribution patterns rather than reflecting random variation.

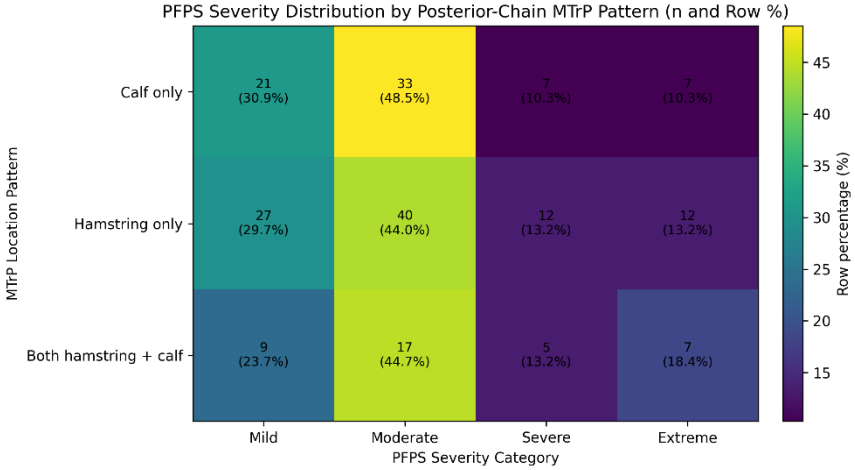

Figure 1 PFPS Severity Distribution by Posterior-Chain MTrP Pattern (n and Row %)

Severity distribution differed meaningfully across posterior-chain MTrP patterns, with the both hamstring + calf group showing a higher proportion of extreme PFPS severity (18.4%) compared with hamstring-only (13.2%) and calf-only (10.3%), alongside the lowest proportion of mild severity (23.7%). In contrast, moderate severity remained predominant across all patterns (44.0%–48.5%), while severe severity ranged from 10.3% to 13.2%, indicating that multi-region posterior-chain myofascial involvement is associated with a greater shift toward high-severity PFPS categories.

DISCUSSION

The present study evaluated posterior-chain myofascial involvement in a relatively large sample of young adults with patellofemoral pain syndrome (PFPS) and demonstrated that myofascial trigger points (MTrPs) in the hamstring and calf muscle groups were common and significantly associated with PFPS severity categories. Although PFPS is widely understood as a multifactorial pain condition influenced by loading patterns, neuromuscular control, and local tissue sensitivity, clinical attention has often remained concentrated around the patella and quadriceps mechanism, with comparatively less focus on distal and posterior-chain myofascial contributors. The current findings support the clinical relevance of expanding assessment beyond the anterior thigh and retinacular structures by showing that posterior-chain MTrP distribution is not merely incidental in PFPS presentations and appears related to symptom severity distribution patterns. (12,13)

A key observation was that participants with combined hamstring and calf MTrPs demonstrated a greater proportion of extreme PFPS severity compared with those exhibiting MTrPs in only one posterior-chain region. While the study design does not permit causal inference, several plausible mechanisms may explain why a broader posterior-chain myofascial burden is associated with more severe PFPS presentations. Myofascial trigger points are characterized by localized hyperalgesia and altered neuromuscular behavior, including reduced pressure pain thresholds, changes in motor recruitment, and potentially increased nociceptive input that contributes to pain sensitization. Diagnostic consensus efforts emphasize that MTrPs may contribute to both local pain and referred pain patterns alongside functional weakness and restricted motion, which may amplify pain experiences during patellofemoral loading tasks such as squatting, stair negotiation, and running. (12,14)

Biomechanically, hamstring and calf function interact with knee joint loading and lower-limb kinematics. Reduced ankle dorsiflexion range of motion has been documented in individuals with PFPS compared with controls, and altered dorsiflexion may promote compensatory movement strategies such as excessive pronation, dynamic knee valgus, or altered tibial rotation during functional activities, thereby increasing patellofemoral joint stress. Furthermore, occupational and clinical studies suggest that hamstring strength asymmetry and limited ankle dorsiflexion may coexist

with PFPS, reinforcing the concept that PFPS symptoms may reflect a kinetic-chain disorder rather than an isolated patellofemoral problem. When myofascial dysfunction is present in both the hamstring and calf muscles, the combined effects on lower-limb mechanics may contribute to persistent loading intolerance and heightened symptom severity. (15,16)

The findings are also consistent with previous work describing increased MTrP prevalence in individuals with anterior knee pain and PFPS across the hip and thigh musculature. Prior evidence indicates that active MTrPs may be more frequent in anterior knee pain populations and may refer pain toward the anterior knee region, potentially intensifying perceived patellofemoral symptoms. Studies evaluating PFPS have also reported correlations between quadriceps trigger point burden and pain measures, suggesting that myofascial dysfunction may be linked to symptom intensity even when structural pathology is not dominant. Although much of the existing literature has focused on quadriceps, hip, and lumbopelvic muscles, the current study strengthens the argument that posterior-chain MTrPs deserve attention as part of a comprehensive musculoskeletal evaluation in PFPS. (17–19)

Clinically, these results align with guideline-based models emphasizing multi-factorial management in PFPS, including strength training, motor control retraining, and attention to soft tissue contributions to pain and movement restriction. A growing consensus supports exercise therapy targeting the hip and knee musculature, as well as the adjunctive use of manual therapy and taping in selected patients. Given the current findings, integrating systematic assessment and treatment of posterior-chain MTrPs may be a rational component of individualized PFPS rehabilitation, particularly for individuals demonstrating higher severity categories or more persistent symptoms. However, the evidence base for trigger point interventions in PFPS remains mixed and varies by technique and implementation, with some trials suggesting pain reduction after needling-based interventions and others emphasizing the importance of combined multimodal programs rather than single interventions alone. Therefore, posterior-chain MTrP findings should be interpreted as potential clinical contributors to symptom severity that may guide targeted soft-tissue strategies within a broader rehabilitation framework. (13,20,21)

Several methodological considerations should be acknowledged. First, the cross-sectional design prevents conclusions regarding whether MTrPs precede PFPS onset or develop as secondary consequences of pain-related movement patterns and muscle guarding. Second, MTrP identification relied on palpation-based assessment, which may be subject to inter-examiner variability despite the existence of international diagnostic criteria; future studies should strengthen reliability by standardizing examiner training and reporting inter-rater agreement. Third, the use of convenience sampling and the male-dominant sample may limit generalizability to broader PFPS populations, particularly female athletes where PFPS prevalence is often substantial. Fourth, although a strong association was demonstrated between MTrP pattern and PFPS severity categories, potential confounders such as activity level, training load, symptom duration, psychosocial features, and biomechanical characteristics (e.g., foot posture, hip strength, dorsiflexion range) were not incorporated into multivariable modeling, which should be prioritized in future research to determine independent contributions of posterior-chain MTrPs. (13,22)

Future investigations should adopt longitudinal and mechanistic designs to clarify temporal directionality, and randomized clinical trials should evaluate whether adding posterior-chain MTrP–targeted interventions improves pain and function beyond guideline-based strengthening programs. In addition, future studies should include validated PFPS-specific patient-reported measures and incorporate objective biomechanical and neuromuscular outcomes to determine whether posterior-chain myofascial dysfunction is associated with measurable movement impairments linked to patellofemoral joint loading. Such research would advance understanding of PFPS as an integrated kinetic-chain disorder and support development of more precise, clinically interpretable rehabilitation pathways. (13,20)

CONCLUSION

In young adults with patellofemoral pain syndrome, myofascial trigger points in the hamstring and calf muscle groups were common and demonstrated a statistically significant and clinically meaningful association with PFPS severity categories, with the highest proportion of extreme severity observed when MTrPs were present in both posterior-chain regions. Although causality cannot be inferred due to the cross-sectional design, the findings support incorporating posterior-chain myofascial assessment into PFPS clinical evaluation and highlight the need for longitudinal and interventional studies to determine whether targeted management of hamstring and calf MTrPs contributes to improved pain and functional outcomes in PFPS.

REFERENCE

1. Villafañe JH, Lopez-Royo MP, Herrero P, Valdes K, Cantero-Téllez R, Pedersini P, et al. Prevalence of myofascial trigger points in poststroke patients with painful shoulders: a cross-sectional study. PM R. 2019;11(10):1077-1082.
2. Gaitonde DY, Ericksen A, Robbins RC. Patellofemoral pain syndrome. Am Fam Physician. 2019;99(2):88-94.
3. Baeumler P, Hupe K, Irnich D. Proposal of a diagnostic algorithm for myofascial trigger points based on a multiple correspondence analysis of cross-sectional data. BMC Musculoskelet Disord. 2023;24(1):1-14.
4. Barbero M, Schneebeli A, Koetsier E, Maino P. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Curr Opin Support Palliat Care. 2019;13(3):270-276.
5. Sánchez Romero EA, Fernández Carnero J, Villafañe JH, Calvo-Lobo C, Ochoa Sáez V, Burgos Caballero V, et al. Prevalence of myofascial trigger points in patients with mild to moderate painful knee osteoarthritis: a secondary analysis. J Clin Med. 2020;9(8):2561.
6. Ejaz F, Safdar M, Ejaz H. Comparative effectiveness of integrated neuromuscular inhibition technique along with conventional treatment vs conventional treatment alone in patients of knee osteoarthritis. Pak J Med Health Sci. 2023;17(1):859.
7. Rozenfeld E, Finestone AS, Moran U, Damri E, Kalichman L. The prevalence of myofascial trigger points in hip and thigh areas in anterior knee pain patients. J Bodyw Mov Ther. 2020;24(1):31-38.
8. Siljander B, Tompkins M, Martinez-Cano JP. A review of the lateral patellofemoral joint: anatomy, biomechanics, and surgical procedures. JAAOS Glob Res Rev. 2022;6(7).
9. Felli L, Alessio-Mazzola M, Lovisolo S, Capello AG, Formica M, Maffulli N. Anatomy and biomechanics of the medial patellotibial ligament: a systematic review. Surgeon. 2021;19(5):e168-e174.
10. Gulati A, McElrath C, Wadhwa V, Shah JP, Chhabra A. Current clinical, radiological and treatment perspectives of patellofemoral pain syndrome. Br J Radiol. 2018;91(1086):20170456.

11. Werey RW, Hoglund LT, Barton CJ, Bolgla LA, Scalzitti DA, Logerstedt DS, et al. Patellofemoral pain: clinical practice guidelines linked to the ICF from the academy of orthopaedic physical therapy of the American physical therapy association. J Orthop Sports Phys Ther. 2019;49(9):CPG1-CPG95.
12. Bump JM, Lewis L. Patellofemoral syndrome. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2022.
13. Collins NJ, Barton CJ, van Middelkoop M, Callaghan MJ, Rathleff MS, Vicenzino BT, et al. 2018 consensus statement on exercise therapy and physical interventions to treat patellofemoral pain: recommendations from the 5th International Patellofemoral Pain Research Retreat. Br J Sports Med. 2018;52(18):1170-1178.
14. Sisk D, Fredericson M. Update of risk factors, diagnosis, and management of patellofemoral pain. Curr Rev Musculoskelet Med. 2019;12:534-541.
15. Sisk D, Fredericson M. Taping, bracing, and injection treatment for patellofemoral pain and patellar tendinopathy. Curr Rev Musculoskelet Med. 2020;13:537-544.
16. Kesary Y, Singh V, Frenkel-Rutenberg T, Greenberg A, Dekel S, Schwarzkopf R, et al. Botulinum toxin injections as salvage therapy is beneficial for management of patellofemoral pain syndrome. Knee Surg Relat Res. 2021;33(1):1-8.
17. Ma YT, Li LH, Han Q, Wang XL, Jia PY, Huang QM, et al. Effects of trigger point dry needling on neuromuscular performance and pain of individuals affected by patellofemoral pain: a randomized controlled trial. J Pain Res. 2020;13:1677-1686.
18. Walli O, McCay M, Tiu T. Patellofemoral syndrome: a review of diagnosis and treatment. Curr Phys Med Rehabil Rep. 2023;11:1-5.
19. Lee JH, Jang KM, Kim E, Rhim HC, Kim HD. Static and dynamic quadriceps stretching exercises in patients with patellofemoral pain: a randomized controlled trial. Sports Health. 2021;13(5):482-489.
20. Maclachlan LR, Collins NJ, Matthews ML, Hodges PW, Vicenzino B. The psychological features of patellofemoral pain: a systematic review. Br J Sports Med. 2017;51(9):732-742.
21. Alqahtani AS, Parveen S. Kinesio taping as a therapeutic tool for masticatory myofascial pain syndrome—an insight view. Int J Environ Res Public Health. 2023;20(5):3872.
22. Bagcier F, Yurdakul OV, Üşen A, Bozdag M. The relationship between gluteus medius latent trigger point and muscle strength in healthy subjects. J Bodyw Mov Ther. 2022;29:140-145.
23. Das R, Jhajharia B. Correlation between latent myofascial trigger point and peak torque production of lower limb muscles on sports person. NeuroQuantology. 2022;20(19):467-483.
24. Kim H, Shin W. Immediate effects of myofascial release using vibration foam rolling methods on hamstrings range of motion, flexibility, pressure pain thresholds and dynamic balance. J Int Acad Phys Ther Res. 2020;11(2):2042-2051.
25. Mellinger S, Neurohr GA. Evidence based treatment options for common knee injuries in runners. Ann Transl Med. 2019;7(Suppl 7).
26. Weon YS, Ahn SH, Kim JH, Gwak GT, Kwon OY. Comparison of knee muscle strength and ankle dorsiflexion range of motion between standing workers with and without patellofemoral pain syndrome. Phys Ther Korea. 2020;27(4):241-249.
27. Clinical decision-making considerations for the integration of manual therapy as an intervention for patellofemoral pain. Orthop Phys Ther Pract. 2020;32(3):130-136.
28. Fernández-de-Las-Peñas C, Dommerholt J. International consensus on diagnostic criteria and clinical considerations of myofascial trigger points: a Delphi study. Pain Med. 2018;19(1):142-150.
29. Jellad A, Kalai A, Guedria M, Jguirim M, Elmhamdi S, Salah S, et al. Combined hip abductor and external rotator strengthening and hip internal rotator stretching improves pain and function in patients with patellofemoral pain syndrome: a randomized controlled trial with crossover design. Orthop J Sports Med. 2021;9(4):2325967121989729.
30. Ma YT, Dong YL, Wang B, Xie WP, Huang QM, Zheng YJ. Dry needling on latent and active myofascial trigger points versus oral diclofenac in patients with knee osteoarthritis: a randomized controlled trial. BMC Musculoskelet Disord. 2023;24(1):36.
31. Ahmed AS, Padhy GK, Bawiskar D. Effectiveness of myofascial release in increasing hamstring flexibility: a brief study. 2022.
32. Roach S, Sorenson E, Headley B, San Juan JG. Prevalence of myofascial trigger points in the hip in patellofemoral pain. Arch Phys Med Rehabil. 2023;94(3):522-526.
33. Dippenaar DL, Korporaal C, Jones A, Brantingham JW, Globe G, Snyder WR. Myofascial trigger points in the quadriceps femoris muscle of patellofemoral pain syndrome subjects assessed and correlated with NRS-101, algometry, and piloted patellofemoral pain severity and myofascial diagnostic scales. J Am Chiropr Assoc. 2022;45(2).
34. Das R, Jhajharia B. Correlation between latent myofascial trigger point and peak torque production of lower limb muscles on sports person. Age (Years). 2022;20(2.13):20-45.
35. Tang CT, Song B. Acupuncture and dry needling for sports performance and recovery. Curr Sports Med Rep. 2022;21(6):213-218.
36. Xhardo K, Cordun M, Iacob GS, Cotrobaș-Dascălu VT, Măzăreanu A, Vazne Ž. The effects of a myofascial treatment in the rehabilitation of ankle's range of motion. 2022.
37. Smith KLF. The role of and relationship between hamstring and quadriceps muscle myofascial trigger points in patients with patellofemoral pain syndrome [dissertation]. 2020.
38. Samani M, Ghaffarinejad F, Abolahrari-Shirazi S, Khodadadi T, Roshan F. Prevalence and sensitivity of trigger points in lumbo-pelvic-hip muscles in patients with patellofemoral pain syndrome. J Bodyw Mov Ther. 2020;24(1):126-130.
39. Sánchez Romero EA, Fernández Carnero J, Villafañe JH, Calvo-Lobo C, Ochoa Sáez V, Burgos Caballero V, et al. Prevalence of myofascial trigger points in patients with mild to moderate painful knee osteoarthritis: a secondary analysis. J Clin Med. 2020;9(8):2561.
40. Das R, Jhajharia B, Ciocan VC, Sharma A, Majumdar I. Myofascial trigger points and its influence on athletic performance. NeuroQuantology. 2022;20(19):467-483.
41. Martínez-Jiménez EM, Jiménez-Fernández R, Corral-Liria I, Rodríguez-Sanz D, Calvo-Lobo C, López-López D, et al. Effects of myofascial induction therapy on ankle range of motion and pressure pain threshold in trigger points of the gastrocnemius: a clinical trial. Biomedicines. 2023;11(9):2590.

DOI: https://doi.org/10.61919/fyjfez51

42. Rahman H, Afzal Z, Ramzan O, Tauseef S, Usman T, Qadeer SI, Maqbool S. Effects of iliotibial band myofascial release with/without stretching with iliotibial band tightness secondary to knee osteoarthritis. Pak J Med Health Sci. 2023;17(2):73.
43. Sonali ST. Effectiveness of quadriceps myofascial release technique for the treatment of knee osteoarthritis [dissertation]. 2022.
44. Mohamed IT, Kandil OA. Knee myofascial pain and knee-abdomen syndromes; a newly identified knee disorders, commonly misdiagnosed as arthritis: multiple case study. Int J Innov Res Med Sci. 2022;7(2).
45. Toscaro CG, Gonçalves R, Quarto BF, Neto LF, Braz IA, Jambassi Filho JC. Effects of myofascial mobilization on flexibility in young men adults. J Health Sci. 2022;24(3):206-210.