INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

RELATIONSHIP BETWEEN BODY MASS INDEX (BMI) AND PATELLOFEMORAL PAIN SYNDROME (PFPS) IN RECREATIONAL CRICKETERS AT MEDICAL COLLEGES IN LAHORE

Original Research

Muhammad Zeeshan Khawar[1], Saddiqa Qamar[2], Maida Mushtaq[2]*, Zainab Masood[4], Syed Moez ul Hasan[1], Usama Nadeem[1], Syed Usman Ahmad Gillani[1]
[1]Allama Iqbal Medical College, University of Health Science Lahore, Pakistan.
[2]Lecturer, Physiotherapy and Rehabilitation, School of Health Sciences University of Management and Technology, Lahore, Pakistan.
[3]Lecturer, Nutrition and Dietetics, School of Health Sciences University of Management and Technology, Lahore, Pakistan.
Corresponding Author: Maida Mushtaq, Lecturer, Physiotherapy and Rehabilitation, School of Health Sciences University of Management and Technology, Lahore, Pakistan, maida.mushtaq@umt.edu.pk
Acknowledgement: The authors gratefully acknowledge the participation of all medical student athletes in this study.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Patellofemoral Pain Syndrome (PFPS) is a prevalent cause of anterior knee pain, particularly in individuals involved in sports requiring repetitive knee loading. Although numerous studies have explored PFPS in elite athletes, limited attention has been given to recreational cricketers, especially within the Pakistani context. Given that Body Mass Index (BMI) may contribute to increased mechanical stress on the patellofemoral joint, investigating its role in this specific population could offer meaningful insights for injury prevention and management.

Objective: To evaluate the association between Body Mass Index (BMI) and the severity of Patellofemoral Pain Syndrome (PFPS) among recreational cricketers enrolled in medical colleges in Lahore, Pakistan.

Methods: A cross-sectional study design was employed, including 91 recreational cricketers aged 18 to 30 years from various medical colleges in Lahore. Convenience sampling was used. Participants were required to have a non-traumatic history of anterior knee pain for at least three months. The Kujala Anterior Knee Pain Scale (AKPS) was utilized to assess symptom severity, and BMI was calculated using standard anthropometric measurements. Participants were stratified into BMI categories for subgroup analysis. Data were analyzed using SPSS version 26, with Pearson's correlation applied to examine the relationship between BMI and AKP scores.

Results: The sample had a mean age of 25.01 ± 2.00 years and a mean BMI of 23.90 ± 2.79 kg/m². The average AKP score was 87.30 ± 13.58. A statistically significant moderate negative correlation was observed between BMI and AKP scores ($r = -0.487$, $p < 0.001$), indicating that higher BMI levels were associated with more severe patellofemoral pain.

Conclusion: Higher BMI is moderately associated with increased severity of PFPS symptoms among recreational cricketers. These findings underscore the importance of considering body composition in preventive and rehabilitative approaches for non-professional athletes.

Keywords: Anterior Knee Pain, Body Mass Index, Cross-Sectional Studies, Knee Injuries, Pain Measurement, Patellofemoral Pain Syndrome, Recreational Athletes.

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

INTRODUCTION

Patellofemoral Pain Syndrome (PFPS), often referred to as "runner's knee," represents one of the most common musculoskeletal complaints associated with anterior knee pain, particularly among physically active populations (1). It typically manifests as discomfort around or behind the patella, intensifying during weight-bearing activities that involve knee flexion, such as squatting, stair climbing, or prolonged sitting (2). While the pathophysiology of PFPS is multifactorial, repetitive mechanical stress on the patellofemoral joint has been frequently implicated, making it especially prevalent in sports requiring running, jumping, or rapid directional changes (3). Despite the abundance of literature focused on elite and professional athletes, relatively little research has explored the burden of PFPS in recreational athletes, a gap that becomes particularly relevant when considering the role of body composition and Body Mass Index (BMI) in this subgroup (4). Elevated BMI is widely considered a contributing factor to increased mechanical load on the knee joint, potentially accelerating cartilage wear and joint inflammation, thereby exacerbating the risk and symptomatology of PFPS (5). This risk may be further amplified in sports such as cricket, which is characterized by frequent sprints, lateral movements, and sustained lower limb engagement—placing recreational players, particularly those with higher BMI, at increased risk of knee-related injuries (6). While some researchers emphasize BMI as a prominent risk factor, others suggest that variables such as quadriceps strength, neuromuscular control, joint alignment, and training technique are more critical in PFPS etiology (7,8). Nonetheless, BMI's role within the context of recreational-level cricket remains inadequately studied, especially when intersected with the unique lifestyle and physical conditioning patterns of medical students.

In this regard, medical students who participate casually in cricket often do so without access to formal training regimens, injury prevention strategies, or biomechanical assessments typically afforded to professional athletes (9,10). This population may experience additional strain due to sedentary academic demands, limited physical activity, and dietary habits that contribute to increased BMI, potentially heightening the risk of musculoskeletal issues such as PFPS (11). Compounding this concern is the limited availability of educational resources addressing the influence of weight on joint health, especially in institutional settings where recreational sports are not formally structured or supervised. Within the Pakistani context, cricket enjoys cultural ubiquity, particularly in educational settings such as medical colleges in Lahore, where students commonly engage in informal matches despite lacking access to adequate physical conditioning or preventive care. Consequently, the interplay between BMI and PFPS in these recreational cricketers is an area deserving of focused inquiry. Previous studies have largely overlooked this subgroup, leaving a notable gap in understanding how non-elite sports participation intersects with biomechanical stress and knee pathology in young adults (9-12). Therefore, this study aims to investigate whether an elevated Body Mass Index is associated with an increased risk and severity of Patellofemoral Pain Syndrome among recreational cricketers in medical colleges. By addressing this gap, the research intends to inform early identification, targeted preventive strategies, and appropriate conditioning protocols in this vulnerable and often neglected population.

METHODS

This study employed a cross-sectional design to assess the relationship between Body Mass Index (BMI) and the prevalence of Patellofemoral Pain Syndrome (PFPS) among recreational cricketers enrolled in medical colleges in Lahore. A total of 91 participants were recruited through purposive sampling, based on clearly defined inclusion and exclusion criteria. The inclusion criteria comprised medical students aged between 18 and 30 years who played recreational cricket at least once per week, had a BMI ranging from 18.5 to 29.9, and reported a non-traumatic onset of anterior knee pain persisting for at least three months. This pain had to be exacerbated by activities involving knee loading, such as stair climbing or squatting, to be considered consistent with PFPS symptomatology. Participants were excluded if they were professional cricketers, had a history of knee surgery or traumatic knee injury, were underweight (BMI <18.5) or obese (BMI ≥30), engaged in high-intensity sports other than cricket, or had clinically diagnosed conditions such as osteoarthritis or rheumatoid arthritis (13). These criteria ensured a homogenous sample relevant to the research objective and minimized confounding variables that might otherwise influence knee pain presentation.

Ethical approval for the study was obtained from the relevant Institutional Review Board (IRB), and written informed consent was secured from all participants prior to data collection. The Kujala Anterior Knee Pain Scale (AKPS), a validated questionnaire for

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

assessing PFPS-related symptoms and functional limitations, was used as the primary tool for data collection. This instrument evaluates multiple dimensions of knee pain and function, yielding a composite score that reflects the severity of symptoms. Data were coded and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Quantitative variables, such as age, BMI, and Kujala scores, were reported using means and standard deviations. Where applicable, qualitative variables were presented as frequencies and percentages. To determine the strength and direction of the association between BMI and PFPS, the Pearson correlation test was applied. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study analyzed data from 91 recreational cricketers to assess demographic variables and their association with anterior knee pain. The participants ranged in age from 20 to 30 years, with a mean age of 25.01 ± 2.00 years. The mean height was recorded as 67.86 ± 2.42 inches, while the mean weight was 71.08 ± 8.84 kg. Body Mass Index (BMI) values ranged from 18.50 to 29.69, with a calculated mean of 23.90 ± 2.79. A statistically significant weak negative correlation was observed between age and anterior knee pain score, with a Pearson correlation coefficient of -0.287 ($p = 0.006$). This suggests that increasing age was modestly associated with more severe symptoms of patellofemoral pain. Additionally, a moderate negative correlation was found between BMI and anterior knee pain score, with a Pearson coefficient of -0.487 ($p < 0.001$), indicating that higher BMI levels were moderately associated with increased severity of anterior knee pain among the study participants. These findings support the presence of an inverse relationship between both age and BMI with Kujala scores in this population, consistent with the hypothesis that increased body weight and age are contributing factors to the development or exacerbation of PFPS in recreational cricketers.

In terms of clinical prevalence, it was observed that approximately 41.8% of the participants met the criteria for clinically significant Patellofemoral Pain Syndrome (PFPS), defined by a Kujala (AKP) score of less than 80. The remaining 58.2% did not report PFPS-level symptoms based on the scoring threshold. To explore the relationship between symptom severity and BMI categories, participants were stratified accordingly. Among those with a normal BMI (18.5–21.9), the majority (77.8%) reported mild symptoms, with no cases falling in the severe category. Conversely, individuals in the overweight category (BMI 25–29.9) showed a marked increase in symptom severity, with 59.5% classified as having severe PFPS and none reporting mild symptoms. Participants in the upper normal BMI range (22–24.9) predominantly fell within the moderate severity group. These findings reinforce the moderate inverse correlation identified between BMI and AKP scores and indicate a trend toward greater PFPS severity in individuals with higher BMI values. This stratified insight highlights the increased susceptibility to PFPS with rising BMI and underscores the need for targeted preventive strategies in recreational athletic populations.

Table 1: Descriptive Statistics of Participants' Anthropometric Measurements

	Mean	Std. Deviation	Min	Max
Height	67.86	2.416	60	73
Weight	71.08	8.84	52	91
BMI	**23.90**	**2.792**	**18.50**	**29.69**

Table 1: Correlation of Age and Body mass index with Anterior knee pain

		Anterior	Knee	Pain Score
Age (Years)	Pearson Correlation	-.287		
	Sig.(2-tailed)	.006		
Body Mass Index	Pearson Correlation	-.487		
	Sig.(2-tailed)	**.000**		

Table 3: PFPS Prevalence and Stratified AKP Analysis

BMI Category	Mild	Moderate	Severe
Normal (18.5–21.9)	28	8	0
Upper Normal (22–24.9)	5	13	0
Overweight (25–29.9)	0	15	22

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

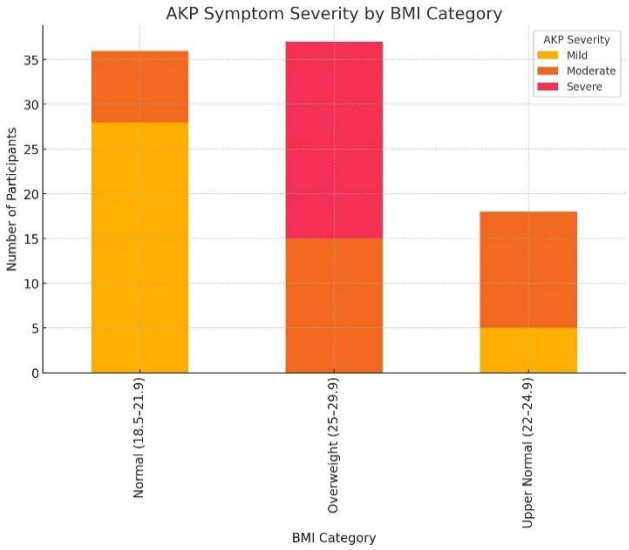

Figure 1 AKP Symptom Severity by BMI Category

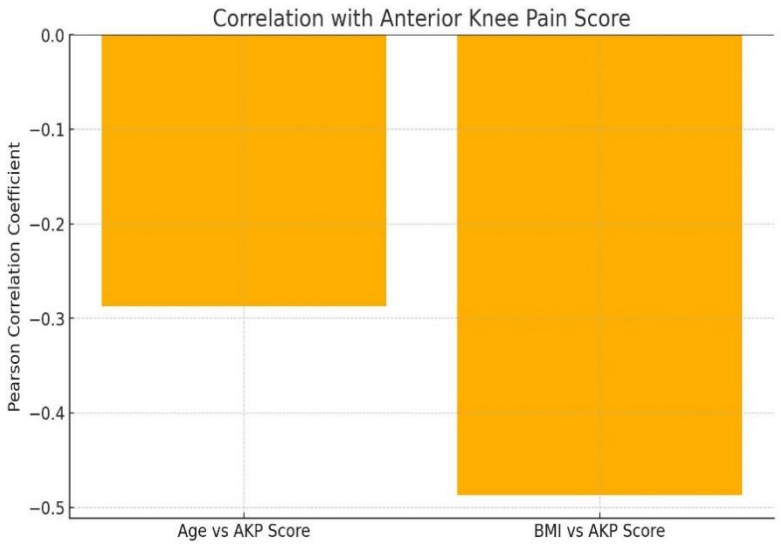

Figure 1 Correlation with Anterior Knee Pain Score

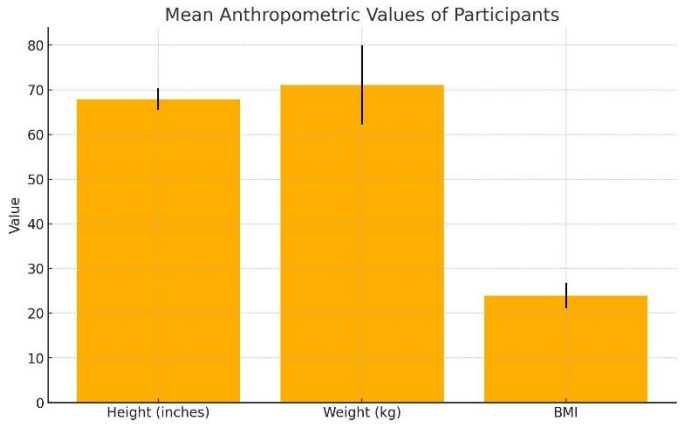

Figure 3Mean Anthropometric Values of Participants

DISCUSSION

The current study demonstrated a moderate negative correlation between Body Mass Index (BMI) and anterior knee pain severity, supporting the hypothesis that increased body mass contributes to elevated mechanical loading at the patellofemoral joint, thereby exacerbating symptoms of Patellofemoral Pain Syndrome (PFPS). The findings align with earlier research highlighting BMI as a modifiable risk factor associated with both patellofemoral discomfort and broader knee joint pain, particularly in populations exposed to repetitive knee loading. Studies conducted in urban and athletic populations have previously reported significant associations between higher BMI levels and increased PFPS prevalence, indicating a consistent trend across various demographic groups and geographical regions (14,15). Research conducted among young adult women also reinforced the present findings by demonstrating a strong association between BMI and PFPS, particularly in cohorts with mean BMI values slightly higher than those in the current sample (16-18). This discrepancy in average BMI may partly explain differences in symptom intensity across studies. Moreover, the recreational cricket players in the present study likely engaged in more consistent physical loading compared to other populations assessed in earlier work, which adds a crucial contextual factor to understanding the biomechanical implications of body weight on knee function (19).

Conversely, other studies have reported minimal or no significant relationship between BMI and PFPS, particularly in low-activity populations. These differences may be attributed to variations in physical activity exposure, musculoskeletal conditioning, or even methodological differences in pain assessment and diagnostic criteria (19-21). In such populations, the influence of body mass on the patellofemoral joint might be insufficient to provoke symptomatic thresholds, underscoring the importance of considering activity level as a mediating variable in PFPS risk assessment. Further complexity arises from evidence that highlights non-weight-bearing biomechanical contributors to PFPS, such as quadriceps weakness, hip tightness, overuse injuries, and patellar tracking deviations (5,20). This reinforces the understanding that PFPS is not solely determined by load-bearing parameters like BMI, but rather results from a multifactorial interplay of anatomical, neuromuscular, and biomechanical influences. Therefore, while BMI holds relevance in identifying at-risk individuals, especially within active subpopulations, it should be interpreted within a broader clinical framework that includes assessment of functional movement, muscle imbalances, and joint kinematics (22,23). One of the strengths of this study lies in its focus on a specific yet underrepresented group—recreational cricketers within medical colleges—offering valuable insight into a demographic that experiences regular athletic activity without access to professional-level training, rehabilitation, or preventive strategies. Additionally, the use of the Kujala Score provided a standardized, validated method for assessing PFPS symptom severity in a contextually appropriate manner.

Nonetheless, several limitations should be acknowledged. The cross-sectional nature of the study limits the ability to infer causality between BMI and PFPS severity. The absence of a control group, as well as the reliance on self-reported symptoms without clinical imaging, may affect diagnostic accuracy. Moreover, other potential risk modifiers such as lower limb alignment, muscular strength, joint mobility, and previous injury history were not assessed. These omissions limit the comprehensiveness of the risk profile and should be addressed in future longitudinal studies. Future research should adopt a prospective design and incorporate a more comprehensive biomechanical assessment to identify predictive risk factors. Stratifying subjects by physical activity intensity, incorporating muscle strength testing, and evaluating lower limb alignment could offer a more complete understanding of PFPS pathogenesis. Additionally, interventional studies focusing on weight management, strengthening, and conditioning in recreational athletes may provide actionable strategies for prevention and rehabilitation. In summary, the study provides compelling evidence of an association between increased BMI and the severity of PFPS symptoms among recreational cricketers, supporting the need for integrated preventive approaches that consider both load-bearing and functional biomechanical factors.

CONCLUSION

This study concludes that a higher Body Mass Index is moderately associated with increased severity of patellofemoral pain symptoms among recreational cricketers, emphasizing BMI as a notable contributing factor in this population. The findings underscore the multifactorial nature of PFPS, shaped not only by body composition but also by biomechanical and activity-related influences. By focusing on an underrepresented group—medical students engaged in casual yet regular sports activity—this research adds meaningful insight to the growing evidence that recreational athletes, despite their non-professional status, are not exempt from injury risks. These results advocate for the integration of preventive conditioning and weight management strategies within athletic programs targeting amateur sports participants.

AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Zeeshan Khawar	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Saddiqa Qamar	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Maida Mushtaq*	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Zainab Masood	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

Author	Contribution
Syed Moez ul Hasan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Usama Nadeem	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Syed Usman Ahmad Gillani	Contributed to study concept and Data collection Has given Final Approval of the version to be published

REFERENCES

1. Basharat H, Asghar F, Raza A, Islam F, John N, Jabbar R, et al. ASSOCIATION OF BMI WITH PATELLOFEMORAL PAIN SYNDROME IN FEMALE OF REPRODUCTIVE AGE.
2. Chebet H. Dynamic Balance among Long-Distance Runners with Achilles Tendinopathy in High Altitude Training Camps in Western Kenya: JKUAT-COHES; 2023.
3. JÄGER CRL. POTENTIAL RUNNING RELATED INJURY CONTRIBUTORS IN SOUTH AFRICAN LONG-DISTANCE RUNNERS.
4. Hee Z. Correlation between lower limb alignment and patellofemoral pain syndrome among badminton players in UTAR: UTAR; 2022.
5. Ferreira AS, Mentiplay BF, Taborda B, Pazzinatto MF, de Azevedo FM, Silva DDOJJos, et al. Exploring overweight and obesity beyond body mass index: a body composition analysis in people with and without patellofemoral pain. 2023;12(5):630-8.
6. Naderi A, Gholami F, Degens H. Assessing Body Mass Index as a Predictor of Running-Related Injuries: A Systematic Review and Meta-analysis. 2025.
7. Ishtiaq N, Riaz H, Tahir M, Asghar Z, Rasool AG, Sial WHJTHJoP, et al. Effects of Trigger Point Dry Needling in Patients with Patellofemoral Pain Syndrome; A Randomized Controlled Trial: Dry Needling in Patellofemoral Pain Syndrome. 2023;3(5):505-17.
8. Muhammad R, Shah SDBJJoMS. FREQUENCY OF THE KNEE POSTEROLATERAL CORNER INJURY IN COMBINATION WITH ANTERIOR CRUCIATE LIGAMENT INJURY: RETRACTED ARTICLE. 2024;32(1):6-11.
9. Sharma P, Shrivastava VK, Sathe P, Soni KJJoSoIP. Myofascial Release of Iliotibial Band and Eccentric Quadriceps Exercises for Patellofemoral Pain Syndrome in Recreational Cyclists. 2025:10.4103.
10. Shallan A, Hawamdeh M, Gaowgzeh R, Obaidat S, Jastania R, Muhsen A, et al. The association between kinesiophobia and dynamic balance in patients with patellofemoral pain syndrome. 2023;27(6).
11. Paniagua C, Albarian A, Wang T, Siedentopp T. Efficacy of Vibration on Muscle Performance in Athletes and Patients with Patellofemoral Pain Syndrome: Azusa Pacific University; 2022.
12. Aboelhassan MA, Kattabei OMA, Khaddah MA, Elkady SMJEJoHM. Prevalence and Risk Factor of Patellofemoral Pain and Knee Pain in Great Cairo Obese Population. 2024;94(1):656-62.
13. Nafez S, Ghanavati T, Akbari M, Khalilian-Ekrami N, Salahzadeh ZJM, Ligaments, Journal T. Relationship between Functional and Laboratory Balance Assessment in Females with Patellofemoral Pain Syndrome. 2023;13(3).
14. Khan B, Khan OY, Zehra S, Azhar A, Fatima SJPJPS. Association between obesity and risk of knee osteoarthritis. 2020;33(1):295-8.
15. Bhatti SA, Waseem I, Akhtar M, Arslan SA, Batool F, Ahmed AJPBJ. Association of Patellofemoral Syndrome with Prolonged Duration of Sitting among Teachers; A Cross-Sectional Survey: Association of Patellofemoral Syndrome with Prolonged Duration of Sitting. 2022:321-4.
16. Hansen R, Rathleff MS, Brushøj C, Magnusson SP, Henriksen MJjoo, therapy sp. Differential Effects of Quadriceps and Hip Muscle Exercises for Patellofemoral Pain: A Secondary Effect Modifier Analysis of a Randomized Trial. 2024;54(11):732-42.
17. Arrebola LS, Carvalho RTd, Lima VCdO, Percivale KAN, Oliveira VGCd, Pinfildi CEJFeM. Influence of body mass index on patellofemoral pain. 2020;33: e003309.
18. Gibbs D, Flanigan DC, Mallory N, Qin C, Milliron EM, Cavendish PA, et al. The Effect of Body Mass Index on Outcomes of Isolated Medial Patellofemoral Ligament Reconstruction. 2025;13(5):23259671251331140.

19. Nilmart P, Vongsirinavarat M, Khawsuwan P, Chumthong K, Tadein R, Komalasari DRJBOS, et al. Impact of telehealth-based therapeutic exercise on pain, functional performance and dynamic knee valgus in young adult females with patellofemoral pain: a randomised controlled trial. 2024;10(4).
20. Widhiantari NKE, Widnyana M, Jawi IMJK, Comprehensive P. Risk factors of the patellofemoral pain syndrome. 2023;2(3):74-80.
21. Ferreira AS, Mentiplay BF, Taborda B, Pazzinatto MF, de Azevedo FM, de Oliveira Silva D. Overweight and obesity in young adults with patellofemoral pain: Impact on functional capacity and strength. J Sport Health Sci. 2023;12(2):202-11.
22. Ferreira AS, Mentiplay BF, Taborda B, Pazzinatto MF, de Azevedo FM, De Oliveira Silva D. Exploring overweight and obesity beyond body mass index: A body composition analysis in people with and without patellofemoral pain. J Sport Health Sci. 2023;12(5):630-8.
23. Hansen R, Rathleff MS, Brushøj C, Magnusson SP, Henriksen M. Differential Effects of Quadriceps and Hip Muscle Exercises for Patellofemoral Pain: A Secondary Effect Modifier Analysis of a Randomized Trial. J Orthop Sports Phys Ther. 2024;54(11):732-42.