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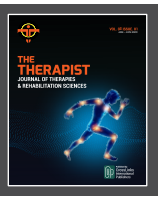

Original Article

Comparative Effects of Core Neuromuscular Training versus Conservative Physical Therapy to Reduce Pain and Improve Functional Performance in Patients with Patellofemoral Pain Syndrome

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ABSTRACT

Running, stair climbing, jumping and squatting represent a few of the activities that can cause patellofemoral pain syndrome. Patellofemoral pain syndrome (PFPS) is one of the most typical causes of anterior knee discomfort in teenagers and persons below Sixty. **Objective:** To contrast the results of conservative physical treatment plus core neuromuscular training and conservative physical therapy alone. **Methods:** It was a quasi-experimental study in which patients suffering from patellofemoral pain syndrome were selected on the basis of convenience sampling from Government hospitals of Faisalabad after meeting the inclusion and exclusion criteria. Twenty patients with patellofemoral pain syndrome were divided into Group A and Group B at random. Participants of Group A performed neuromuscular core training plus conservative physical therapy exercise program for 4 weeks while participants of group B performed conservative physical therapy exercise alone for 4 weeks. Data were analyzed by SPSS version 27.0. **Results:** Following therapy, the pain level was substantially reduced in both of the groups ($P < 0.05$) with Intervention group showing better results. Similarly, there was improvement in scores of Kujala questionnaire in both groups after treatment ($P< 0.05$) but the results of Intervention group were comparatively better. **Conclusions:** There is significant effect of core neuromuscular training plus conservative physical therapy as compared to conservative physical therapy alone.

INTRODUCTION

Pain either behind or around the patella that is exacerbated by at least one action that produces stress on the patella when the knee bends and bearing load is referred to as PFPS [1]. Pain results from a minimum of two of the following behaviors: ascending or descending stairs, running, leaping, maintaining a seated position, squatting, or prolonged kneeling [2, 3]. It occurs more frequently in women and has a yearly incidence of about 23% in adults, rising to 29% in teenagers [4]. Diffuse discomfort, frequently along the knee's medial surface, and pain coming from the anterior portion of the patella are typical symptoms [5, 6]. The primary causes of patellofemoral pain syndrome are numerous and may be related to bio-mechanical or neurophysiological alterations [7, 8]. Individual factors include muscle imbalances, weak quadriceps, and significantly greater hip abductor muscular endurance in contrast to another thigh musculature [9, 10]. While treating patellofemoral pain syndrome, most patients respond well to conservative treatment [11]. For the most common causes of anterior knee discomfort, non-operative care aimed at the underlying cause is the first line of treatment. Surgery should only be carried out when all other options have failed [12, 13]. In case of surgical treatment, the tibial tubercle

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osteotomy (TTO) is a flexible procedure for managing patellofemoral arthritis [14]. In case of patellofemoral pain syndrome patients, a common minimally invasive treatment for musculotendinous diseases is percutaneous electrolysis [15]. Exercises for the core might help PFPS patients with their function and pain [16, 17]. Clara et al., reported that both therapies were successful in treating PFPS patients' discomfort and enhancing their functional outcomes. However, the core strengthening group considerably outscored the knee strengthening group in terms of improvement in knee function [18].

The objective of study was comparing the outcomes of conservative physical treatment and core neuromuscular training in patellofemoral pain syndrome patients.

METHODS

It was a quasi-experimental study in which participants were selected using convenient sampling technique. Sample size was 20 and it was collected using OpenEpi tool. Participants were recruited using lottery method. The duration of the study was 6 months; it commenced from 1st March 2023 and concluded on 31st August 2023.This study was carried out in Government Hospitals of Faisalabad: District Head Quarter (DHQ), Allied Hospital Faisalabad and National Hospital Faisalabad. Subjects were included on the basis of following inclusion criteria: Aged 18-40 years, both male and female, included subject must feel pain after 2 functional activities at least e.g. step up or step down and after 2 month of running, squatting, jumping or kneeling., positive patellar grind test and before any intervention the subject must score 50 to 80 on Kujala Questionnaire and participants with any disease related to ligament, tendon or meniscus, patellar dislocation or subluxation or any surgical history of spine or lower back without referred pains and other congenital illnesses like DM, RA etc. were excluded from the study. Visual Analogue Scale (VAS) and Kujala Questionnaire were the outcome measurement collection tools used in the study. Participants were randomly divided into two groups: Group A - the intervention group - received conservative physical therapy including Hamstring, ITB and gastrocnemius stretching; Quadriceps setting; SLR; Forward step-up and lateral step up exercises plus core neuromuscular training such as bridging while holding a small ball between knees; Side lying hip abduction (clam exercise); lateral SLR; curl-up while holding a small ball between bent knees and straight knees; isometric hip abduction in standing position. Group B - the control group - received only conservative physical therapy exercises mentioned above. Shapiro Wilk test indicated that data were normally distributed. Independent sample t test was used for between group analysis of Visual Analogue Scale (VAS) and Kujala scale while paired sample t test was used for within group analysis of Visual analogue Scale and Kujala scale. Data were analyzed by SPSS version 27.0.

RESULTS

Table 1 shows frequency distribution of gender wherein 7(35%) were male and 13(65%) were female and age of the participants those who participated in study.

Table 1: Frequency distribution of gender and age

Variables		Frequency (%)
Gender	Female	7 (35)
	Male	13 (65)
	Total	20 (100)
Age	21-30	12 (60)
	31-40	8 (40)
	Total	20 (100)

Table 2 shows that Independent sample t test was applied for between groups comparison. There were non-significant differences (p=0.605) between groups in Visual analogue scale at baseline with mean ±SD of intervention group (7.400 ±1.349) and control group (7.100 ±1.197). After treatment mean ±SD of intervention group (4.300 ±1.636) and control group (5.700± 1.059) with t value (-2.271) and significant p value (.036). Intervention group reduce more pain than control group.

Table 2: Between group difference of Visual analogue Scale at baseline and after treatment.

Outcome Measure	Treatment Groups				p-value	t-value
	Intervention Group		Control Group			
	N	Mean ± SD	N	Mean ± SD		
Visual analogue Scale at baseline	10	7.400 ±1.349	10	7.100 ± 1.197	.526	.605
Visual analogue Scale after Treatment	10	4.300 ±1.636	10	5.700 ±1.059	-2.271	.036

Table 3 shows that Independent sample t test was applied for between groups comparison. There were non-significant differences (p=0.978) between groups in Kujala scale at baseline with mean ±SD of intervention group (68.600 ±8.884) and control group (68.500 ±6.687). After treatment mean ±SD of intervention group (79.400 ±6.345) and control group (73.000± 6.182) with t value (2.284) and significant p value (.035). Intervention show more improvement than control group.

Table 3: Between group difference of Kujala Scale at baseline and after treatment

Outcome Measure	Treatment Groups				p-value	t-value
	Intervention Group		Control Group			
	N	Mean ± SD	N	Mean ± SD		
Kujala Scale at baseline	10	68.600±8.884	10	68.500±6.687	.028	.978
Kujala Scale after Treatment	10	79.400±6.345	10	73.000±6.182	2.284	.035

Table 4 shows within group difference in which Paired sample t test was applied. Intervention Group shows paired

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difference of visual analogue scale is (3.100) with significant p value (<.001) and paired difference of control group (1.400) with significant p value (<.001).

Table 4: Within group difference of Visual Analogue Scale Paired sample t test used at baseline and after post interventions.

Outcome Measure	Treatment Groups			
	Intervention Group		Control Group	
	N	Mean ± SD	N	Mean ± SD
Visual analogue Scale at baseline	10	7.100±1.197	10	7.400±1.349
Visual analogue Scale after Treatment	10	5.700±1.059	10	4.300±1.636
Paired Differences	-	1.400±.516	-	3.100±1.286
p-value	-	<.001	-	<.001

Within group difference paired sample t test was applied. Intervention Group show paired difference of Kujala scale is (-10.800) with significant p value (<.001) and paired difference of control group (-4.500) with significant p value (<.001).

Table 5: Within group difference of Kujala Scale Paired sample t test used at baseline and after post interventions

Outcome Measure	Treatment Groups			
	Intervention Group		Control Group	
	N	Mean ± SD	N	Mean ± SD
Kujala Scale at baseline	10	68.600±8.884	10	68.500±6.687
Kujala Scale after Treatment	10	79.400±6.345	10	73.000±6.182
Paired Differences	-	-10.800±4.131	-	-4.500±.849
p-value	-	<.001	-	<.001

DISCUSSION

The main goal of the current study was to compare the effectiveness of core neuromuscular training in reducing pain and enhancing functional abilities in patients with patellofemoral pain syndrome when combined with conservative physical therapy versus when conservative physical therapy was used alone. According to our study's findings, patellofemoral pain syndrome patients in the intervention group displayed an increase in functional performance and a discernible difference in pain intensity. Since PFPS patients have a unique pattern of recruitment of musculature, core neuromuscular training must have rectified the incorrect muscle recruitment in order to provide stability to proximal region, enabling the immediate realization of this improvement. A randomized control trial was carried out in 2019 by Moteallah *et al.,* to investigate the consequences of core neuromuscular training in women with patellofemoral pain syndrome. In their trial, after therapy the pain score was noticeably lower with p value equal to 0.001 and p value of Kujala score after treatment was less than 0.05 in both treatment and control group with treatment group showing better results. While in our study the p value was less than 0.05 in both VAS and Kujala scoring after treatment with significant effects in intervention group [16]. We did a study to see if core neuromuscular training could help with patellofemoral pain syndrome. Both guys and girls were part of the study, but mostly girls (65%) and fewer boys (35%). Our findings matched up with other research that says girls tend to get this type of pain more than boys. A study was conducted in 2016 by Chevidikunnan *et al.,* using core musculature strengthening for reducing pain and improving balance in females suffering from patellofemoral pain syndrome. In their study, after treatment the value of SD of VAS in control and treatment group was 3.26 and 4.17 respectively having less than 0.05 p value. In our study, the SD values of VAS in the control and intervention group were 1.059 and 1.636 respectively with p value of 0.036 [19]. A study was conducted by Foroughi and colleagues to look for core postural control in patellofemoral pain syndrome patients. In their study, the NRS and Kujala questionnaire showed the value of p less than 0.001 in both control and intervention group after treatment with intervention group showing better results [20]. In our study, VAS showed that the value of p was 0.036 after treatment and in case of Kujala questionnaire the value of p was 0.035 with more significant results in intervention group. In 2021 a study conducted by Tazesh and colleagues to assess the impact of core stability training in individuals with patellofemoral pain syndrome. In that study. the standard deviation of VAS at baseline was 41.6(20.7) and 46.6(17.5) for control and intervention group respectively and SD value after treatment for control and intervention group was 27.4(16.4) and 19.4(13.4). The value of standard deviation of Kujala questionnaire at baseline was 70.4(11.8) and 68.6(11.3) and SD value after treatment was 79.8(10.4) and 84.3(8.6) for control and intervention group respectively. While our study showed that in case of VAS, SD values at baseline were 1.197 and 1.349 and after treatment values were 1.059 and 1.636 for control and treatment group respectively. Similarly, for AKPS, the values of SD at baseline and after treatment were 6.687 and 6.182 for control group. For treatment group, SD value at baseline was shown to be 8.884 and after treatment it decreased to 6.345 [21]. The study encountered some limitations. Firstly, the sample size was relatively small, which may have impacted the generalizability of the findings. To enhance the validity of our results, future research with larger sample sizes and similar study designs is warranted. Secondly, our analysis was constrained by the lack of assessment of knee and core proprioception, as well as the strength of muscles in the lower limbs and trunk. This limitation may have influenced the comprehensiveness of our findings. Lastly, comorbidities were not discussed in our study, which could

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have implications for the interpretation of results. Future studies should allocate adequate time for implementing interventions to ensure accurate results.

CONCLUSIONS

The study concluded that both treatments effectively reduced pain and improved functional performance. However, combining core neuromuscular training with conservative physical therapy yielded significantly better results. Similarly, both interventions showed benefits in improving functional performance, with the core neuromuscular training group demonstrating superior outcomes.

Authors Contribution

Conceptualization: AK
Methodology: NJ
Formal analysis: NF
Writing-review and editing: AK, NJ, NF

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Gaitonde DY, Ericksen A, Robbins RC. Patellofemoral pain syndrome. American Family Physician. 2019 Jan; 99(2): 88-94.

[2] Tramontano M, Pagnotta S, Lunghi C, Manzo C, Manzo F, Consolo S et al. Assessment and management of somatic dysfunctions in patients with patellofemoral pain syndrome. Journal of Osteopathic Medicine. 2020 Mar; 120(3): 165-73. doi: 10.7556/jaoa.2020.029.

[3] Azab AR, Abdelbasset WK, Basha MA, Mahmoud WS, Elsayed AE, Saleh AK et al. Incorporation of Pilates-based core strengthening exercises into the rehabilitation protocol for adolescents with patellofemoral pain syndrome: a randomized clinical trial. European Review for Medical & Pharmacological Sciences. 2022 Feb; 26(4).

[4] Yañez-Álvarez A, Bermúdez-Pulgarín B, Hernández-Sánchez S, Albornoz-Cabello M. Effects of exercise combined with whole body vibration in patients with patellofemoral pain syndrome: a randomised-controlled clinical trial. BMC Musculoskeletal Disorders. 2020 Dec; 21(1): 1-1. doi: 10.1186/s12891-020-03599-2.

[5] 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 Surgery & Related Research. 2021 Dec; 33(1): 1-8. doi: 10.1186/s43019-021-00121-3.

[6] Xie P, István B, Liang M. The Relationship between Patellofemoral Pain Syndrome and Hip Biomechanics: A Systematic Review with Meta-Analysis. Healthcare. 2022 Dec; 11(1): 99. doi: doi.org/10.3390/healthcare11010099. doi: 10.3390/healthcare11010099.

[7] Clifford AM, Dillon S, Hartigan K, O'Leary H, Constantinou M. The effects of McConnell patellofemoral joint and tibial internal rotation limitation taping techniques in people with Patellofemoral pain syndrome. Gait & Posture. 2020 Oct; 82: 266-72. doi: 10.1016/j.gaitpost.2020.09.010.

[8] Alsulaimani BH. Effectiveness of patellar mobilization in patellofemoral pain syndrome. MOJ Orthopedics & Rheumatology. 2019; 11(1): 31-3. doi: 10.15406/mojor.2019.11.00465.

[9] Pereira PM, Baptista JS, Conceição F, Duarte J, Ferraz J, Costa JT. Patellofemoral pain syndrome risk associated with squats: A systematic review. International Journal of Environmental Research and Public Health. 2022 Jul; 19(15): 9241. doi: 10.3390/ijerph19159241.

[10] Emamvirdi M, Hosseinzadeh M, Letafatkar A, Thomas AC, Dos' Santos T, Smania N et al.Comparing kine matic asymmetry and lateral step-down test scores in healthy, chronic ankle instability, and patell ofemoral pain syndrome female basketball players: A cross-sectional study. Scientific Reports. 2023 Jul; 13(1): 12412. doi: 10.1038/s41598-023-39625-1.

[11] Singer MS and Halawa AM. Outcome of arthroscopic radiofrequency denervation of the patella in the management of resistant patellofemoral pain syndrome. The Egyptian Orthopaedic Journal. 2020 Jul; 55(3): 127-30. doi: 10.4103/1110-1148.319293.

[12] Pereira PM, Duarte J, Santos Baptista J, Torres Costa J. Patellofemoral pain syndrome risk factors analysis in selective garbage truck drivers. Occupational and Environmental Safety and Health III. Springer; 2021. 357-68. doi: 10.1007/978-3-030-89617-1_32.

[13] Alshaharani MS, Lohman EB, Bahjri K, Harp T, Alameri M, Jaber H et al. Comparison of Protonics™ Knee Brace with Sport Cord on Knee Pain and Function in Patients with Patellofemoral Pain Syndrome: A Randomized Controlled Trial. Journal of sport rehabilitation. 2019 Oct; 29(5): 547-54. doi: 10.1123 /jsr.2018-0171.

[14] Atzmon R, Steen A, Vel MS, Pierre K, Murray IR, Sherman SL. Tibial tubercle osteotomy to unload the patellofemoral joint. Journal of Cartilage & Joint

DOI: https://doi.org/10.54393/tt.v5i01.190

Preservation. 2023 Mar; 3(1): 100112. doi: 10.1016/j.jcjp.2023.100112.

[15] Valera-Calero JA, Sánchez-Mayoral-Martín A, Varol U. Short-term effectiveness of high-and low-intensity percutaneous electrolysis in patients with patellofemoral pain syndrome: A pilot study. World Journal of Orthopedics. 2021 Oct; 12(10): 781. doi: 10.5312/wjo.v12.i10.781.

[16] Motealleh A, Mohamadi M, Moghadam MB, Nejati N, Arjang N, Ebrahimi N. Effects of core neuromuscular training on pain, balance, and functional performance in women with patellofemoral pain syndrome: a clinical trial. Journal of Chiropractic Medicine. 2019 Mar; 18(1): 9-18. doi: 10.1016/j.jcm.2018.07.006.

[17] Prieto-García LF, Cortés-Reyes E, Lara-Cotacio G, Rodríguez-Corredor LC. Therapeutic effect of two muscle strengthening programs in patients with patellofemoral pain syndrome. A randomized controlled clinical trial. Revista de la Facultad de Medicina. 2021 Jun; 69(2). doi: 10.15446/revfacmed.v69n2.85599.

[18] 1Clara SM, Arulmozhe A, Kanna BS. A Study to Compare Effectiveness of Hip Core Strengthening and Knee Strengthening Exercises in the Treatment of Patellofemoral Pain Syndrome: A Prospective Study.

[19] Chevidikunnan MF, Al Saif A, Gaowgzeh RA, Mamdouh KA. Effectiveness of core muscle strengthening for improving pain and dynamic balance among female patients with patellofemoral pain syndrome. Journal of Physical Therapy Science. 2016; 28(5): 1518-23. doi: 10.1589/jpts.28.1518.

[20] Foroughi F, Sobhani S, Yoosefinejad AK, Motealleh A. Added value of isolated core postural control training on knee pain and function in women with patellofemoral pain syndrome: a randomized controlled trial. Archives of Physical Medicine and Rehabilitation. 2019 Feb; 100(2): 220-9. doi: 10.1016/j.apmr.2018.08.180.

[21] Tazesh B, Mansournia MA, Halabchi F. Additional effects of core stability exercises on pain and function of patients with patellofemoral pain: A randomized controlled trial. Journal of Orthopaedics, Trauma and Rehabilitation. 2021: 2210491721989075. doi: 10.1177/2210491721989075.