

# Effects of Hip and Hip Core Muscles Strengthening Versus Knee Muscle Strengthening for the Management of Anterior Knee Pain

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## ABSTRACT

**Objective:** To compare the effects of hip and hip core muscles strengthening versus knee muscles strengthening to improve pain and functional ability in patients with anterior knee pain.

**Methodology:** A Quasi experimental trial was conducted in Physiotherapy department of Tehsil Head Quarter Hospital, Ahmad Pur East after taking approval from ethical review board. A sample of 30 patients was taken. Group A was given hip and hip core muscles strengthening while Group B was treated with knee muscles strengthening exercises. The participants were completed Anterior Knee Pain Scale (AKPS), Visual Analogue Scale (VAS) and Knee injury and Osteoarthritis Outcome Score (KOOS) scale at baseline and after 6 weeks with 2.5 Sessions per week. Data was analyzed by using SPSS 21.

**Results:** Result showed that there were 26.7 % (n=4) males and 73.3% (n=11) females in hip and core muscle strengthening group while 33.3% (n=5) males and 66.7 % (n=10) females in knee muscle strengthening. In Across group comparison, Visual Analogue Scale showed significant difference for pain score at 6 weeks while Anterior Knee Pain Scale showed no significant difference across the group comparison as P value greater than 0.05.

**Conclusion:** Hip and hip core muscle strengthening exercises are more effective than knee strengthening exercises to manage anterior knee pain and function.

**Key Words:** Knee joint, Patellofemoral Pain Syndrome, Quadriceps Muscle.

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## INTRODUCTION

Anterior knee pain is an idiopathic disorder commonly more prevalent amongst physically active persons i.e., during squatting, climbing stairs, running, jumping as well as prolonged sitting but it has been reported in a wide range of people<sup>1</sup>. Anterior knee pain has been accredited due to numerous causes such as patellofemoral misalignment, overuse, idiopathic, degenerative and traumatic<sup>2</sup>. Mostly researchers have been focused on identification of its true cause of the dysfunction and pain due to its high prevalence.

At the current time, the primary theory is maltracking or Patellofemoral misalignment are symptoms of Anterior knee pain. Theoretically several factors are thought to be contributing in abnormal alignment and tracking of patella. These factors include: quadriceps angle (Q-angle) increased, imbalance of quadriceps muscles, weakness of quadriceps, excessive tightness of soft tissues, altered foot kinematics and weakness of the hip<sup>3,4</sup>.

Common reasons for the condition of added knee joint injury might include hitting the kneecap or falling on it. A few factors that could prompt it, Like, muscular imbalances or weaknesses, especially in the quadriceps muscles at the front of the thigh, tight hamstrings muscle, short ligaments around your knee joint and problems with weight bearing and alignment through your feet<sup>5,6</sup>.

The knee-joint is knowingly multifaceted joint. Traditional management and intervention techniques are wide range and are based on complex factors causing anterior knee pain. Treatment's techniques i.e., mobilization of patella, lower limbs stretching, retraining of quadriceps, foot kinematics correction by foot orthoses and

taping of patella are components of treatment design for improving patellar alignment<sup>7</sup>.

Tape has been widely accepted in clinical practices after McConnell's landmark paper<sup>8</sup> McConnell taping was proposed to generate patellar realignment medially within the trochlear groove to reduce the pain and improve function by enhancing the control and tracking of patella<sup>9</sup>. patellofemoral joint is under much stress due to excessive hip motion especially in transverse and frontal planes<sup>10</sup>. This excessive hip motion may be produced due to the weakness of muscles that surround hip joint<sup>8</sup> Neuromuscular system and specifically the vasti muscles should be the favored area for investigation and study<sup>9</sup> The neuromuscular control of Vasti muscles have been extensively investigated by using invasive and non-invasive techniques and measurements of Electromyography (EMG). More recently, anterior knee pain is proposed to be due to reduced hip muscles strength and reduced core endurance.<sup>11,12</sup>

The aim of current study was to improve patient's health status, personal satisfaction and life quality through implementing correct exercise regimen for managing anterior knee pain. This study is also aimed to establish best and efficient protocol for treatment of anterior knee pain.

## METHODS

A sample of 30 patients was recruited in the present study after being calculated by Epitool Software. The Study was a quasi experimental trial and it was conducted in physiotherapy department of Tehsil head quarter hospital Ahmad pur east after taking approval from ethical review committee of the hospital. Consecutive sampling technique

was used to collect the data. Both male and female with age range of 15 to 35 years and minimum pain score of 3 on visual analogue scale for at least 4 weeks persistent with prolonged sitting, running and ascending/ descending stairs were included in the study. Participants with History of meniscal injury or any intra-articular injury, osteoarthritis, cruciate ligaments or collateral ligaments tenderness or laxity, tenderness to tendon of patella, iliotibial band, Osgood-Schlatter disease and evidence of effusion were excluded. The participants were divided into two groups. Group A was given hip and hip core muscles strengthening exercises including hip Abductors, hip Extensors, Hip External rotators, Internal rotators strengthening exercises while Group B was given knee extensors (Quadriceps)

Strengthening exercises for six weeks with five sessions per week. Participants were assessed on anterior knee pain scale (AKPS), visual analogue scale (VAS) and knee injury and osteoarthritis outcome score (KOOS) at baseline and after 6 weeks. Pre and post treatment scores were taken. Data was analyzed using IBM SPSS 21.

## RESULTS

There were 4 (26.7%) males and 11 (73.3 %) females with mean ( $\pm$ S.D.) of  $1.58 \pm 0.51$  in group A while 5 (33.3%) males and 10 (66.7%) females with mean ( $\pm$ S.D.) of  $1.33 \pm 0.49$  in group B. Mean ( $\pm$ S.D.) age of the participants was  $28. \pm 4.54$  in group A while  $30 \pm 2.71$  in group B.

**Table 1:** Demographics of participants

Study Groups		N	Mean	Std. Deviation
Hip and hip core Strengthening Protocol (Group A)	<b>Age</b>	15	28.73	$\pm 4.54$
	<b>Gender</b>	15		
	Male	4 (26.7%)		
	Female	11 (73.3%)	1.58	$\pm 0.51$
Knee Strengthening Protocol (Group B)	<b>Age</b>	15	30.26	$\pm 2.71$
	<b>Gender</b>	15		
	Male	5 (33.3%)	1.33	$\pm 0.49$
	Female	10 (66.7%)		

**Table 2:** Within and Across the Group Comparison of VAS, KOOS and AKPS

WITHIN GROUP COMPARISON OF VAS, KOOS AND AKPS				
	Hip and hip core Strengthening Protocol Group A (n=15)		Knee Strengthening Protocol Group B (n=15)	
	Mean diff. $\pm$ SD	P value	Mean diff. $\pm$ SD	P value
Pre –Post VAS	5.33 $\pm$ 0.816	.001	3.86 $\pm$ 0.833	0.12
Pre-Post KOOS	35.26 $\pm$ 13.98	<0.05	24.80 $\pm$ 3.12	0.25
Pre-Post AKPS	31.86 $\pm$ 12.91	<0.05	27.40 $\pm$ 7.66	1.05
ACROSS THE GROUP COMPARISON OF VAS, KOOS AND AKPS				
	Mean Difference		P value	
Pre-VAS	0.03		1.00	
Post-VAS	-1.46		<0.05	
Pre-KOOS	-10.26		0.001	
Post-KOOS	0.20		0.946	
Pre-AKPS	-1.46		0.721	
Post-AKPS	3.00		0.223	

Table No. 2 shows within and across the group comparison of VAS, KOOS AND AKPS with mean difference and standard p value of pre and post treatment values and within group comparison of VAS, KOOS AND AKPS showed significant difference in Group A as compared to group B.

## DISCUSSION

In current Study results showed greater reduction in the pain and improvement in function for patients involved in the hip and core muscle strengthening group (Group A) than for those involved in knee muscles (quadriceps) strengthening group ( Group B). In group A mean values of Pre and the Post VAS were  $8.40 \pm 0.50$  and  $3.0 \pm 0.88$  respectively and in group B mean values of Pre and the Post VAS were  $8.40 \pm 0.50$  and  $4.53 \pm 4.5$  respectively.

Patients in the hip and core strengthening group reported a clinically meaningful decrease in VAS score than patients in knee protocol.

Our results were agreed to Wong Y-Met al., 2013<sup>(13)</sup> findings. His study showed reduction in pain through VAS, after 3 weeks of HIP based protocol in runner patients with anterior knee pain. This study focused on Hip musculature and showed positive findings to improve knee pain. All these researchers found reduction in pain scores for anterior knee pain in HIP-based rehabilitation practice.

Similar to our study, Dolak et al in 2011<sup>(14)</sup> used physical therapy based exercises in treatment of anterior knee pain. He involved all combinations of chain exercises in Knee protocol which are in contrast with our study. Hence, comparison with previous research become difficult due to dissimilarity in hip and core muscles strengthening and knee muscles strengthening protocols. Patients have

nearly same outcomes report due to greater similarity in both hip and the core muscles and knee-based strengthening protocols.

Though we considered that a specific muscle group was targeted in these protocols, some of these exercises involved similar group of muscles. The gluteal musculature, the main factor of hip and core-based rehabilitation protocol, were involved in exercise (Step-down, Lunge, Wall-slide, Squat etc.) of the knee-based rehabilitation protocols. Similarly, the quadriceps muscles were involved in the hip flexor exercise of the hip and core-based rehabilitation protocol. Therefore, it was assumed that these exercises are not specific for the complete isolation of knee and hip musculature.

## CONCLUSION

Hip and hip core muscle strengthening exercises are more effective than knee strengthening exercises to manage anterior knee pain and function.

## Author's Contributions

LA conceived, designed and did statistical analysis and editing of manuscript

SH, ZH, SR, RRK and HK did data collection and manuscript writing

SH and RRK did final review and approval of manuscript

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## REFERENCES

1. Taunton JE, Ryan MB, Clement D, McKenzie DC, Lloyd-Smith D, Zumbo B. A retrospective case-control analysis of 2002 running injuries. *Br J Sports Med.* 2002;36(2):95-101.
2. Cook C, Mabry L, Reiman MP, Hegedus EJ. Best tests/clinical findings for screening and diagnosis of patellofemoral pain syndrome: a systematic review. *Physiotherapy.* 2012;98(2):93-100.
3. Parikh SN, Nathan ST, Wall EJ, Eismann EA. Complications of medial patellofemoral ligament reconstruction in young patients. *The American journal of sports medicine.* 2013;41(5):1030-8.
4. Masters R, Maxwell J. The theory of reinvestment. *International Review of Sport and Exercise Psychology.* 2008;1(2):160-83.
5. Harrison E, Magee D. Patellofemoral pain syndrome: the ongoing challenges in etiology, diagnosis, and management. *Critical Reviews™ in Physical and Rehabilitation Medicine.* 2001;13(2-3).
6. Callaghan MJ, Selfe J, McHenry A, Oldham JA. Effects of patellar taping on knee joint proprioception in patients with patellofemoral pain syndrome. *Man Ther.* 2008;13(3):192-9.
7. Freddolini M, Placella G, Gervasi G, Morello S, Cerulli G. Quadriceps muscles activity during gait: comparison between PFPS subjects and healthy control. *Musculoskelet Surg.* 2017;101(2):181-7.
8. Bolgia LA, Boling MC. An update for the conservative management of patellofemoral pain syndrome: a systematic review of the literature from 2000 to 2010. *Int J Sports Phys Ther.* 2011;6(2):112.
9. Callaghan MJ, Selfe J. Has the incidence or prevalence of patellofemoral pain in the general population in the United Kingdom been properly evaluated? *Phys Ther Sport.* 2007;8(1):37-43.
10. Gilleard W, McConnell J, Parsons D. The effect of patellar taping on the onset of vastus medialis obliquus and vastus lateralis muscle activity in persons with patellofemoral pain. *Phys Ther.* 1998;78(1):25-32.
11. Wood L, Muller S, Peat G. The epidemiology of patellofemoral disorders in adulthood: a review of routine general practice morbidity recording. *Prim Health Care Res Dev.* 2011;12(2):157-64.
12. Freddolini M, Placella G, Gervasi G, Morello S, Cerulli G. Quadriceps muscles activity during gait: comparison between PFPS subjects and healthy control. *Musculoskelet Surg.* 2017;101(2):181-7.
13. Wong Y-M, Straub RK, Powers CM. The VMO: VL activation ratio while squatting with hip adduction is influenced by the choice of recording electrode. *J Electromyogr Kinesiol.* 2013;23(2):443-7.
14. Dolak KL, Silkman C, McKeon JM, Hosey RG, Lattermann C, Uhl TL. Hip strengthening prior to functional exercises reduces pain sooner than quadriceps strengthening in females with patellofemoral pain syndrome: a randomized clinical trial. *J Orthop Sports Phys Ther.* 2011;41(8):560-70.