Original Research Paper

Volume-9 | Issue-8 | August - 2019 | PRINT ISSN No. 2249 - 555X

Physiotherapy

A STUDY TO KNOW THE EFFECTS OF FUNCTIONAL MOVEMENT TRAINING IN ATHLETES WITH PATELLOFEMORAL PAIN

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ABSTRACT Patellofemoral pain is common among lower limb sports individuals in whom quadriceps strengthening is the very regular physical therapy given. Often these athletes will come across re-injuries or knee pain again because of improper rehabilitation. Recently functional movement training has gained its importance in sports rehabilitation which involves core exercises in a purposeful task oriented movements for overall rehabilitation of athletes. 30 athletes divided into (n=15) functional movement group and (n=15) regular knee physiotherapy group. Both groups were treated for two months, outcome measures were VAS for pain, MMT for quadriceps strength and Functional movement screening. Results showed significant difference in VAS (p value 0.0037), MMT (p value 0.0001) and FMS (p value 0.0001) suggesting functional movement training is better. In conclusion, Functional movement training is beneficial than regular knee physical therapy in rehabilitating athletes with patellofemoral pain.

KEYWORDS : Functional movement training, Quadriceps strengthening and Patellofemoral pain.

Patellofemoral pain is a condition which is also called as anterior knee pain having pain around the patellofemoral joint anteriorly that is surrounding the patella, mostly patients complaining about pain on superior and inferior aspects of patella where quadriceps tendon passes and takes insertion over tibial tubercle. It is very common in individuals who perform physical activities like jumping, running, cycling and other lower limb sports activities.[1]

Common causes for patellofemoral pain are[2]

- Sudden of quadriceps
- Over training
- Q angle abnormalities
- Prolonged standing or weight bearing

Repeated stress on quadriceps muscle will lead to patellar tilts during knee flexion and extension where insufficiency in patellar movements may arise. Commonly medial tilt produced by vastus medialis obliqus will be decreased due to its weakness. Patellar lateral tilt movement increases as vastus medialis obliqus weakness more and more because of which patella mal-tracking happens which causes pain arund the patella.[3]

Alignment of knee, patella can be visualized in radio-imaging techniques where mal-lignments or abnormalities can be ruled out. Whereas soft tissue lesions can be seen thrugh MRIor Athroscopy.[4]

Improving quadriceps strength and maintaining functional balance between all slips of it will be the main target when rehabilitating individuals with patellofemoral pain. Many studies are available in the literature on treating patellofemoral pain in which most of the studies are done on strengthening of quadriceps but no studies were present on functional movement training.

Functional movement training is based on kinetic chains or linkages from proximal to distal joint segments where distal joint movement is influenced by proximal joint stability and strength like handgrip movement dependent on shoulder girdle and upper spine stability and similarly lower limb distal joint movements are influenced by pelvis and lower spine stability. If all the links in the kinetic chains that is head, spine, pelvis which are linked with extremities are in alignment then only movement in the distal extremities will be more functional or purposeful without causing any damage to the links in the kinetic chain.

Most of the individuals with patellofemoral pain will receive treatment only distally or the affected segment where maintaining or optimizing the kinetic chains will not be concentrated. This is where individuals or athletes with patellofemoral pain will experience recurrence of the symptoms again.

METHODOLOGY :

30 athletes with patellofemoral pain were selected randomly with written informed consent and who fulfilled the inclusion criteria. All participants were divided into two groups equally 15 each into experimental group and control group. Participants who were included in the study are of running athletes with pain over anterior knee, positive clarkes sign, patellar grating sensation, increasing pain on knee bending and straightening. Participants knee pain measured with visual analogue scale, quadriceps strength measured with manual muscle testing and overall function measured with functional movement screening. All the measurements were recorded before and after 2 months of total duration of the study.

Experimental group treated with functional movement training along with quadriceps strengthening and ultrasound therapy. Control group treated with quadriceps strengthening and ultrasound therapy.

Quadriceps strengthening : Multiangle quadriceps isometrics, Leg extension exercises on quadriceps table, Leg press exercises, Prone straight leg raising, Wall squats. All these exercises were performed for 2 sets with 15 repetitions each daily twice for two months.

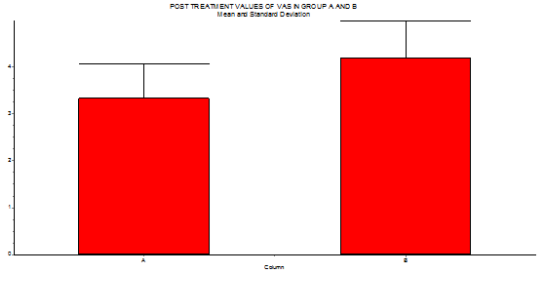
Ultrasound therapy : A frequency of 2 megahertz, power of 1 watt/sq.cm.pulsed mode with a duty cycle of 50% was given daily for 10 minutes for 8 weeks.

Function movement training : Chair raises, Sit to stand, Deep squats, Walking lunges, Split squats, Single leg hops and Box jumps. These exercises were performed daily 2 sets for 10-15 repetitions twice daily for 2 months.

The overall treatment duration for both groups was 2months after which data was analyzed statistically.

Data presentation

Figure.1.Post treatment values of VAS in group A and B

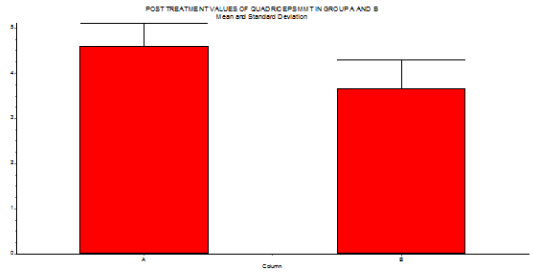


P value is 0.0037, considered very significant.

Table.1. statistical values of VAS in group A and B

Post Treatment	Mean	Standard Deviation	Standard Error Of Mean	T Value	F Value
Group A	3.333	0.7237	0.1869	3.166	1.145
Group B	4.200	0.7746	0.2000		

Figure.2.Post treatment values of Quadriceps MMT in group A and B

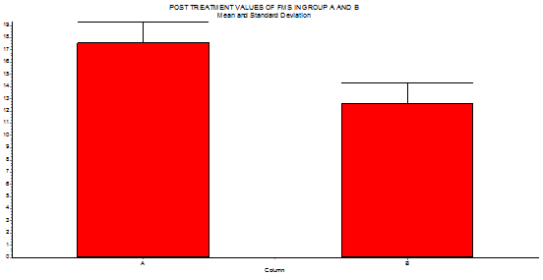


P value is 0.0001, considered extremely significant.

Table.2. statistical values of MMT in group A and B

Post Treatment	Mean	Standard Deviation	Standard Error Of Mean	T Value	F Value
Group A	4.600	0.5071	0.1309	4.525	1.481
Group B	3.667	0.6172	0.1594		

Figure.3.Post treatment values of FMS in group A and



P value is < 0.0001, considered extremely significant.

Table.3. statistical values of FMS in group A and B

Post Treatment	Mean	Standard Deviation	Standard Error Of Mean	T Value	F Value
Group A	17.600	1.682	0.4342	8.142	1.000
Group B	12.600	1.682	0.4342		

RESULTS :

Present study results revealed that group A showed significant difference in VAS with p value 0.0037, MMT with p value 0.0001 and FMS with p value 0.0001 than group B suggesting functional movement training along with regular knee physical therapy is beneficial in rehabilitating patellofemoral pain athletes.

DISCUSSION :

Results in this study suggest that functional movement therapy combined with knee rehabilitation is more effective in treating athletes with patellofemoral pain. Functional movement therapy group showed p value of VAS as 0.0037, quadriceps MMT as 0.0001 and functional movement screening scale as <0.0001 with significant difference from control group.

Lucie Brosseau et al 2001, therapeutic ultrasound therapy for treating is one of several physical therapy interventions used to decrease pain in patellofemoral knee pain.

Proximal muscle rehabilitation will promote greater pain reduction and improved function at long-term when combined with quadriceps rehabilitation for patellofemoral pain, **Simon Lack et al 2015**.

Reed Ferber et al 2015, both the hip-core and knee rehabilitation protocols produced improvements in PFP, function, and strength over 6 weeks. Although outcomes were similar, the Hip protocol resulted in earlier resolution of pain and greater overall gains in strength compared with the Knee protocol.

Cholewicki et al 1997 demonstrated that instability of the spine led to muscular compensations, fatigue, and pain. There is a clear relationship between trunk muscle activity and lower extremity movement which suggests that decreased core stability may predispose to injury and that appropriate training may reduce injury, **Willson, John D. et al 2005**.

Jennifer E. Earl et al 2010, patients with patellofemoral pain syndrome (PFPS) have hip and core muscle weakness leading to dynamic malalignment of the lower extremity. Thus rehabilitation program focusing on strengthening and improving neuromuscular control of the hip and core musculature produces positive patient outcomes, improves hip and core muscle strength, and reduces the knee abduction moment, which is associated with developing PFPS.

Myer, G.D. et al 2005, combination of multiple-injury prevention-training components into a comprehensive program improves measures of performance and movement biomechanics and **Dobek JC et al 2007** said that activities of daily living based training program was able to facilitate improved performance of ADLs, as well as select measures of fitness among older adults.

Manini T et al 2007, the benefits of exercise are dependent on tasks performed during training. Exercise recommendations for low-functioning older adults should reflect task-specific exercise to prevent the onset of disability. Intensive functional training results in better strength improvements, dynamic balance control and coordination while performing daily life tasks of comparable magnitude as those attained from strength training, **Krebs DE et al 2007**.

Mobility exercises were the most common element in functional training which show beneficial effects on muscle strength, balance, mobility, and activities of daily living, particularly when the training content was specific to that outcome that is functional training may be used to improve functional performance in older adults, **Chiung-ju Liu et al 2014**.

The above authors support the present study result that functional movement training which include core strengthening along with regular knee physical therapy will play an essential role in rehabilitating athletes with patellofemoral pain.

CONCLUSION :

Functional movement training is important in rehabilitating lower limb injured athletes especially patellofemoral pain individuals in whom proximal muscle weakness will lead to abnormalities in kinematics of knee.

Master Chart For VAS in Both Groups

S. NO	GROUP A		GROUP B	
	PRE-TREATMENT	POST-TREATMENT	PRE-TREATMENT	POST-TREATMENT
1	7	3	8	5
2	8	4	7	4
3	9	4	9	5
4	6	3	7	4
5	7	3	8	5
6	6	2	6	3
7	8	4	7	4
8	9	4	8	5
9	7	3	9	5
10	6	2	7	4
11	8	4	6	3
12	7	3	9	5
13	8	4	8	4
14	7	3	7	4
15	9	4	6	3

Master Chart For Quadriceps MMT in Both Groups

S. NO	GROUP A		GROUP B	
	PRE-TREATMENT	POST-TREATMENT	PRE-TREATMENT	POST-TREATMENT
1	3.0	5.0	3.0	4.0
2	2.0	4.0	2.0	3.0
3	3.0	5.0	3.0	4.0
4	3.0	5.0	3.0	4.0
5	3.0	4.0	2.0	3.0
6	4.0	5.0	3.0	4.0
7	3.0	4.0	2.0	3.0
8	4.0	5.0	3.0	4.0
9	3.0	4.0	2.0	3.0
10	3.0	5.0	3.0	4.0
11	4.0	5.0	3.0	4.0

12	3.0	5.0	3.0	4.0
13	4.0	5.0	4.0	5.0
14	3.0	4.0	3.0	3.0
15	2.0	4.0	2.0	3.0

Master Chart For FMS in Both Groups

S. NO	GROUP A		GROUP B	
	PRE-TREATMENT	POST-TREATMENT	PRE-TREATMENT	POST-TREATMENT
1	8.0	15.0	8.0	10.0
2	10.0	17.0	9.0	12.0
3	11.0	18.0	10.0	13.0
4	8.0	15.0	8.0	10.0
5	12.0	19.0	11.0	14.0
6	9.0	16.0	10.0	11.0
7	10.0	17.0	9.0	12.0
8	12.0	19.0	11.0	14.0
9	14.0	21.0	13.0	16.0
10	12.0	19.0	12.0	14.0
11	11.0	18.0	10.0	13.0
12	10.0	17.0	9.0	12.0
13	9.0	16.0	8.0	11.0
14	12.0	19.0	11.0	14.0
15	11.0	18.0	10.0	13.0

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