

Comparing the Effectiveness of Mikhled Knee Exercise Program and Quadriceps Based Training in Patellofemoral Pain Syndrome among Collegiate Athletes

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Abstract

Background: Patellofemoral pain syndrome (PFPS) is a relatively common musculoskeletal condition that produces pain at the front of the knee that may last for a long period. It is characterized by extensive pain in/ around the patella. Individuals commonly report an exacerbation of their symptoms when engaging in activities that increase compressive load pressures in the joint.

Purpose: The purpose of the study is to determine the effects of Mikhled knee exercise program and quadriceps based training in patellofemoral pain syndrome among collegiate athletes.

Material and Method: From November 2022 to April 2023, 54 participants with patellofemoral pain syndrome were selected and randomly divided into two equal groups at Saveetha Medical College and Hospital. During a four-week treatment session, Group A received a Mikhled knee exercise program, whereas Group B received quadriceps-based training. Subjects were evaluated twice (pre-treatment and post-treatment) using the Numerical Pain Rating Scale (NPRS) and the Kujala Patellofemoral Scale.

Results: Statistical analysis show that there is a significant change within-group for NPRS, kujala patellofemoral scale in pre and post treatment, with a p value of < 0.0001, the mean of the Mikhled knee exercise program at the post test was shown to be greater than the mean of quadriceps-based training.

Conclusion: According to the findings of this study, the Mikhled knee exercise program is more helpful in participants suffering from patellofemoral pain syndrome than quadriceps-based training persons. The study was limited by the small number of participants.

Key Word: Patellofemoral pain syndrome, Kujala Patellofemoral scale, NPRS, Mikhled knee exercise program.

Introduction

A common musculoskeletal condition called patellofemoral pain syndrome (PFPS) causes discomfort at the front of the knee, which tends to

last a long time.¹ Women are affected around twice as much as men.² The prevalence of “anterior knee pain” is considerable, at 22/1,000 people annually.³

It is characterized by widespread discomfort in/

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around the patella, which gets worse when you sit down for a long time, stand, or climb stairs. Although several extrinsic and intrinsic knee-related variables have been proposed, there has been no conclusive evidence linking foot or ankle traits to knee health.⁴

Patients typically report an exacerbation of their symptoms when performing activities that increase compressive load forces in the joint, such as ascending and descending stairs, bending down, running.⁵

The patellofemoral joint's anatomical and biomechanical characteristics are altered in patellofemoral pain syndrome (PEPS), also known as peripatellar pain.⁶ It's additionally one of the most commonly occurring injuries to the knee reported by athletes in a variety of sports. With a 30% incidence and representing 9% of all injury sustained by young competitors.⁷

A recent study found that although PFPS has been linked to arthritis of the knee and an elevated body mass index, this is not the case in teenage patients.⁸ Because of its tendency for recurrence the syndrome of patellofemoral pain can result in several medical visits, with 94% of patients experiencing pain for a maximum of four years after the first visit and 25% expressing significant discomfort up to 20 years afterwards.⁹

Numerous conservative therapy programs have been carried out in the past.¹⁰ The thermal and non-thermal consequences of therapeutic ultrasound resulted in biological responses such as inflammation reduction, time-regeneration, and muscular tension reduction. By providing ultrasonic energy, therapeutic ultrasound physically and thermally penetrates deep tissue.¹¹

Aim

The aim of this study is to compare the effectiveness of the Mikheld knee exercise program and quadriceps based training in patellofemoral pain syndrome among collegiate athletes.

Material and Method

It was an experimental study conducted on 54 subjects with patellofemoral pain syndrome, ages between 18-25 yrs who were taken from private universities. A convenient sampling method was

used in the study. Study period :November 2022 to April 2023

Inclusion Criteria:

- Subjects who are athletes
- Both genders of age between 18-25 years
- Experienced distributed anterior knee discomfort for at least 8 weeks (about 2 months).
- Patients who have never undergone any treatment.

Exclusion Criteria:

- Tendonitis
- Osgood-Schlatter syndrome
- Previous knee surgery
- Fracture
- History of meniscus damage
- OA knee.

Outcome Measure:

Assessment was done at initial and at the end of the study using

1. Numerical Pain Rating Scale (NPRS)

The NPRS is a segmented numeric version of the visual analog scale (VAS) in which a respondent selects a whole number (0-10 integers) that best reflects the intensity of his/her pain. The 11-point numeric scale ranges from '0' representing no pain extreme (e.g. "no pain") to '10' representing the other pain extreme (e.g. "pain as bad as you can imagine" or "worst pain imaginable").¹²

2. Kujala patellofemoral scale

The Kujala Score or Anterior Knee Pain Scale (AKPS) is a 13-item self-report questionnaire that assesses subjective reactions to activities and symptoms that are known to correlate with anterior knee pain syndrome. The AKPS is graded on a scale of 0 to 100, with 100 being the highest possible score. Lower scores reflect greater pain and disability. The 13 items on the scale are used to assess subjective symptoms and functional restrictions. A score can have a minimum of 0 points or a maximum of 100 points. Athletes would receive a score of 100 if they showed no signs of anterior knee pain.^{13,14}

Procedure

Participants were included considering the inclusion and exclusion criteria. Procedure was explained to the participant & participants were then asked to sign the consent form. Assessment of all the included participants was done according to the assessment form. Participants were randomly divided into two groups i.e group 'A' and 'B'. Group A(n=27), Group B(n=27). Assessment was performed at baseline and after four weeks of study. Both Groups underwent ultrasound with a frequency of 1MHz and continuous mode for a duration of 10 minutes in a comfortable position.

Group A: Mikheld Knee Exercise Program

The Mikheld Knee Exercise Program (MKEP) is a recently developed rehabilitation method that attempts to improve the joint's range of motion, quality of life, health status, discomfort, balance, and muscle strength.

The MKEP technique includes seven therapeutic level postures that should be held for 15-20 minutes each: Level one is supine, level two is on elbows, level three is half sitting, level four is prone, level five is bench long sitting, level six is bench prone, and level seven is bench supine.

The same activity is included in each level but is presented differently as follows:

- 1) The patient was taught to dorsiflex and to straighten the knee joint.
- 2) The patient was instructed to elevate one leg 15 inches above the ground while keeping the knee extended.
- 3) The patient was instructed to stretch his or her leg outward in an abduction stance while maintaining a straight knee.
- 4) The patient was instructed to keep one leg outside of the body and bend it for 30 degrees.
- 5) The patient was instructed to straighten his or her knee while maintaining horizontal leg position.
- 6) The patient was instructed to position his leg inside in a manner similar to a second step, and then to return to step one and take a 30-second rest.

After each adaptive isometric exercise level, participant was asked to hold for ten seconds or number to Ten. The muscle groups of the hamstrings and quad muscles, which are often weak or atrophying in patients, can be most efficiently strengthened through changing the positions used.

The researcher gave the participants instructions to return to class on a regular basis after each session. The researcher called a person to remind them to attend the lesson if they failed to show up for the next session. All subjects were instructed not to take part in any other treatment plans or visit the clinic for supplementary care during the course of the treatment. All participants were required to continue taking their regular medication schedule during the trial.

Group B: Quadriceps Based Training

1. Straight Leg Raise

- Contract your quadriceps and raise the extended leg until it creates a 45-degree angle.
- Hold your leg in this position for two seconds
- 20 times in all. Run two or three sets.

2. Step Up

- Put your left foot on the step.
- As your left leg straightens and tightens, lift your right leg into the air and keep it there for a brief while.
- Return the right leg to the floor gradually.
- Repeat ten repetitions, then swap legs.

3. Short Quad Arc Exercise

- Lay flat on your back with your knees extended.
- Under the knee of the quad, place a bolster.
- Until your leg is fully extended, gradually straighten your knee, contract your quadriceps.
- Keep your knees straight for three to five seconds, then gently return to your starting position.

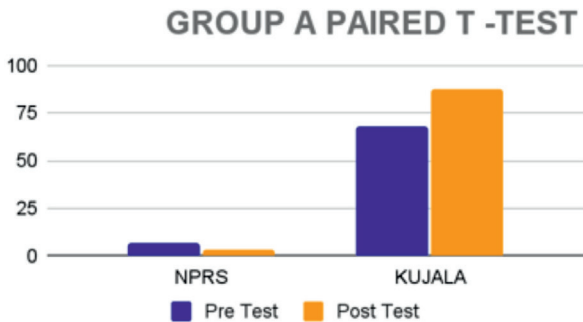
4. Wall Side

- Put your back against a wall and stand up. Your feet should be spaced around shoulder-width.
- Slide your back and hips down the wall gently until your knees are at a 45-degree angle.
- Remain in this position for about 5 seconds, then stand up again.
- Ten to fifteen times, repeat the slide. Perform a few sets.

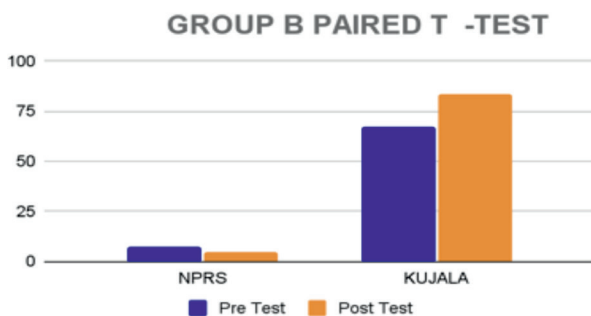
5. Bulgarian Split Squat

- On a bench that is around knee height, position your right foot in front of you and your left foot behind you. Hold your hands firmly to your hips.
- Lower your left knee towards the floor while keeping your back straight. Attempt to maintain your front knees behind your toes and a 90-degree angle at the front knee.
- Push down with your right foot to draw your right knee back before the left knee reaches the floor.

Data Analysis

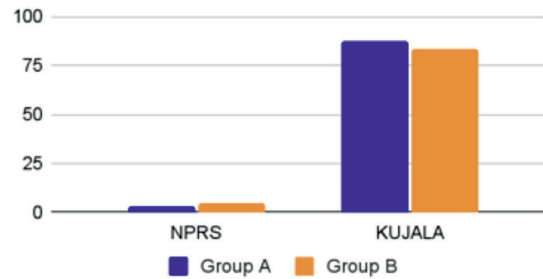


Graph No 1



Graph No 2

UNPAIRED T - TEST



Graph No 3

Result

- The study was conducted on 54 subjects. Both groups had 27 subjects each.
- For NPRS, the mean was 2.89 for Group A (MKEP) and 5 for group B (Quadriceps based training),p value was = 0.0001 which shows that the result was very statistically significant
- For the Kujala patellofemoral scale, the mean was 87.67 for Group A and 83.48 for Group B ,with p values <0.0002 which shows that the result was very statistically significant.

Discussion

The purpose of this research project was to look at the efficacy of Mikhled knee exercise program versus quadriceps-based training on individuals suffering from patellofemoral pain syndrome. According to the findings of the study, mikhled knee exercise program is somewhat more effective than the quadriceps-based training. This is the first study to assess the effectiveness of MKEP against quadriceps-based training programs in PEPS patients. According to the findings of this study, both types of exercise are useful in improving physical function and reducing discomfort during the therapy time.

As a result, the improvement of Mikhled knee exercise program with ultrasonic treatment is much greater than the improvement of the quadriceps-based training. Mikhled knee exercises are a sort of isometric knee exercise with a distinct training effect than quadriceps-based training. MKEP does not require any equipment; However, it may be more convenient for participants to continue completing the exercises at home on their own .

Previous research by Jeffrey A Rixe et.al conducted, a research restricted itself to randomized controlled trials, cohort studies, and crossover case-controlled studies in this review of 33 papers. The most effective therapies for lowering knee pain symptoms and improving function in PFPS patients are quadriceps and hip strengthening coupled with stretches in an organized physiotherapy program.⁽¹⁵⁾ As previous research has demonstrated, interventions like orthotics, proprioceptive learning, and strapping may be useful as adjunct therapy but are ineffective when used alone in persons with PFPS. Furthermore, new study indicates that surgery and pharmacological therapy for PFPS patients is ineffective.¹⁶

Dolak KL et.al A randomized controlled study was conducted. Thirty-three PFPS girls took part in this experiment, which included four weeks of either initial hip strengthening (hip group) or first quadriceps training (quad group), followed by four weeks of a comparable functional weight-bearing exercise program. It has been demonstrated that focusing on hip strength first may be more successful in the treatment of PFPS, allowing for muscular training while reducing exacerbation of patellofemoral symptoms. Those who started with hip exercising reported a much more significant decrease in knee pain after just four weeks of therapy, whereas those who started with quadriceps training required eight weeks of therapy to get a comparable reduction in pain.¹⁷

Herrington L, et al conducted a randomized controlled trial of carrying weight vs non-weight-bearing training for patellofemoral soreness and claims that both bearing weight and non-weight-bearing quadriceps exercises can improve subjective and clinical outcomes in those with PFPS.¹⁸

This study has various limitations that must be noted. For starters, the limited number of participants in each group implies that the findings could have limited applicability. Second, the study primarily focuses on athletes and their lifestyle, food, and activity level, which cannot be accurately captured or quantified. Long-term research with a higher sample size is advised as a future study recommendation to make the study more valid. A study for several age groups can be conducted.

Conclusion

This study compared a Mikheld knee exercise plan with ultrasound to a quadriceps-based training with ultrasound in the management of patellofemoral discomfort syndrome. The findings demonstrated a $p < 0.0001$ significance in all parameters when the prior to and following the NPRS and Kujala scores of both groups were compared. The outcomes of the two groups were similar, however the group that underwent the Mikheld knee exercise program combined with ultrasound improved more post-treatment.

Ethical Clearance: This research work has been approved by the ISRB committee (ApplicationNo:03/085/2022/ISRB/SR/

SCPT).

Source of Funding: Self

Conflict of Interest: No conflict of interest during this research.

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