JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

COMPARATIVE EFFECT OF CONVENTIONAL PHYSIOTHERAPY VERSUS FOOT ORTHOSIS IN PATELLOFEMORAL PAIN SYNDROME IN ADULTS

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Abstract

One of the most prevalent causes of anterior knee discomfort, especially in active adults and adolescents, is patellofemoral pain syndrome (PFPS). Functional tasks including walking, running, climbing stairs, and extended sitting are all greatly impacted. The usefulness of foot orthosis (FO) and conventional physical therapy (CP) in treating PFPS is contrasted in this research. 60 people participated in a 12-week randomized controlled experiment, and pain and functional ratings were used to evaluate the results. The results showed that CP had better long- term results even though both therapies decreased pain and increased functioning. This study emphasizes the value of focused rehabilitation techniques for efficient PFPS management.

Background: PFPS, sometimes known as "runner's knee," is responsible for up to 25% of all knee injuries sustained by active people.[1] Due to biomechanical characteristics including a larger femoral internal rotation and a higher Q-angle, it primarily affects women.[2] Acute knee discomfort during weight-bearing activities requiring knee flexion is a hallmark of the disorder, which is brought on by maltracking or overloading of the patellofemoral joint.[3]

The complex etiology of PFPS must be addressed for effective management:

1. Biomechanical elements such as knee valgus or excessive pronation.
2. Muscle imbalances, such weak hip abductors and quadriceps.
3. Overuse syndromes brought on by the knee joint's repeated stress.

While foot orthosis concentrate on redistributing forces by addressing aberrant foot mechanics, conventional physiotherapy seeks to improve muscular strength, joint mobility, and alignment. Few studies explicitly compare these therapies in the therapy of PFPS, despite their widespread usage.

Keyword : Conventional Physiotherapy (CP) , Foot Orthosis (FO), Visual Analog Scale, Kujala Anterior Knee Pain Scale

Purpose

This study set out to:

1. Assess how well CP and FO reduced pain as determined by the Visual Analog Scale.
2. Evaluate how they affect functioning using the Kujala Anterior Knee Pain Scale.
3. Assess the clinical ramifications of these results for PFPS treatment strategy optimization.

INTRODUCTION

One of the most common causes of anterior knee discomfort, especially among highly active people, is patellofemoral pain syndrome (PFPS). Activities including squatting, sprinting, stair climbing, or extended sitting can cause the syndrome, which is characterized by widespread discomfort behind or around the patella.[3] 20–25% of knee injuries are caused by PFPS, particularly in young adults and adolescents. It is more common in women and is probably caused by biomechanical and anatomical variables such dynamic knee valgus and an elevated Q-angle.[2][4] The best way to manage PFPS is still up for dispute despite its prevalence because of its complex etiology, which makes diagnosis and therapy more difficult.

Biomechanical dysfunctions and muscle imbalances are the fundamental causes of PFPS. One major factor that causes more stress on the surrounding cartilage and subchondral bone is the patella's misalignment inside the femoral groove.[5] Tightness in the iliotibial band and hamstrings, together with weakness in the quadriceps, particularly the vastus medialis oblique (VMO), make these problems worse by interfering with proper patellar tracking.[6] The onset of PFPS is also significantly influenced by extrinsic factors, such as excessive use, inadequate footwear, or inappropriate training methods, which is why athletes and runners are more likely to acquire the disease.[1]

In order to effectively manage PFPS, its complex nature must be addressed. The initial line of treatment is conservative, with foot orthoses (FO) and conventional physical therapy (CP) being often used. Strengthening, stretching, manual therapy, and neuromuscular training are all part of CP's holistic approach, which focuses on the muscular and biomechanical factors that contribute to PFPS.[7] FO, on the other hand, uses mechanical devices to improve lower limb kinematics and rectify excessive pronation in order to address alignment and

load redistribution.[3] Though their relative efficacy is yet unknown, the goals of both therapies are to reduce pain, enhance functioning, and stop recurrence.

Conventional Physiotherapy

Restoring muscle balance and improving patellar alignment are the main goals of conventional physiotherapy, which is seen to be the cornerstone of PFPS treatment. Crucial elements consist of:

1. Strengthening the quadriceps: Straight leg raises and mini-squats are exercises that focus on the quadriceps, especially the VMO, to stabilize the patella and lessen discomfort.[5]

2. Strengthening the external rotators and hip abductors can help prevent dynamic knee valgus, which is a major cause of patellar mal-tracking.[6]

3. Flexibility and Stretching: To reduce excessive lateral patellar pull and increase joint range of motion, target the hamstrings, gastrocnemius, and Iliotibial band (Powers et al., 2012).

4. Manual Therapy: To alleviate localized discomfort and enhance patellar mobility, methods such soft tissue release and patellar mobilization are used.[8]

Numerous studies have shown how effective CP is in reducing pain and enhancing long-term functional results. For instance, strengthening programs that focus on the hip and knee considerably lower symptoms and improve quality of life in people with PFPS, according to a comprehensive review by van der Heijden et al. (2015).[9]

Foot Orthosis

According to Barton et al. (2011)[1], foot orthoses are mechanical devices intended to treat improper foot mechanics, such as excessive pronation, which can lead to changed lower limb alignment and increased stress on the patellofemoral joint. FO resolves:

1. Strain Redistribution: Orthosis lessen the strain applied to the patellofemoral joint during walking and running by adjusting foot position.[3]

2. Shock Absorption: Orthosis' improved cushioning lessens impact pressures on the knee, especially while engaging in high-impact exercises.[4]

3. Alignment Correction: FO improves patellar tracking and lessens anterior knee discomfort by lowering dynamic knee valgus and tibial internal rotation.[5]

Many patients get short-term relief with FO, but its long-term effectiveness has been questioned. Orthoses can temporarily lessen discomfort and increase functioning, according to studies like Collins et al. (2008)[3], but they might not be able to resolve underlying muscle imbalances or biomechanical dysfunctions.

The Reason for Comparing

Both CP and FO have proven to be beneficial in treating PFPS, however it is unclear how effective they are in comparison. According to Boling et al. (2010)[7], CP provides a more thorough and customized strategy that addresses the underlying causes of PFPS in addition to its symptoms. FO, on the other hand, can quickly alleviate symptoms by shifting mechanical stresses, but they might not be able to address underlying dysfunctions (Barton et al., 2011)[1]. It is crucial to compare these two modalities in order to maximize therapeutic results and guide clinical decision-making.

Research Objectives

The aim of this study is to assess and contrast how well CP and FO work to lessen pain and enhance functioning in persons with PFPS. The study aims to fill a significant vacuum in the literature by directly comparing different therapies and provide evidence-based suggestions for medical professionals treating this prevalent ailment.

Materials and Methodology

Study Design

This research lasted 12 weeks and was a randomized controlled experiment. Both the Foot Orthoses (FO) and Conventional Physiotherapy (CP) groups were randomly allocated to the participants. Measures of standardized outcomes were used for assessments both before and after therapy.

Duration of Study

Participants in the FO group wore orthosis every day for the duration of the 12-week trial, whereas those in the CP group attended supervised sessions three times a week.

Sample Size

The research included sixty persons with PFPS (30 per group).

Inclusion Criteria

- Adults between the ages of 18 and 40.
- More than six weeks of ongoing anterior knee discomfort.
- Pain when crouching, climbing stairs, or sitting for extended periods of time.
- No prior history of serious trauma or knee surgery.
- Anatomical anomalies like osteoarthritis or ligament tears are excluded.

- A history of recent orthosis or physiotherapy usage.
- The usage of painkillers during the research period.

ools Used

1. Visual Analog Scale (VAS): Measures pain intensity on a scale of 0 to 10.

2. Kujala Anterior Knee Pain Scale: Evaluates functional limitations in daily and sports activities.

3. Custom Foot Orthosis: Prefabricated and customized based on gait and plantar pressure analysis.

4. Standardized Exercise Protocols: For CP interventions, focusing on quadriceps and hip muscles.

Methodology

Intervention Protocols

1. Conventional Physiotherapy Group:

- Strength training exercises for the hip abductors (e.g., side-lying leg lifts) and quadriceps (e.g., straight leg rises).
- The calf muscles, hamstrings, and Iliotibial band should all be stretched.
- To enhance tracking, manual therapy involves patellar mobilizations.

2. Foot Orthoses Group:

- Participants wore orthoses that were customized for their gait and foot anatomy.
- Guidelines were given for regular use in day-to-day tasks.

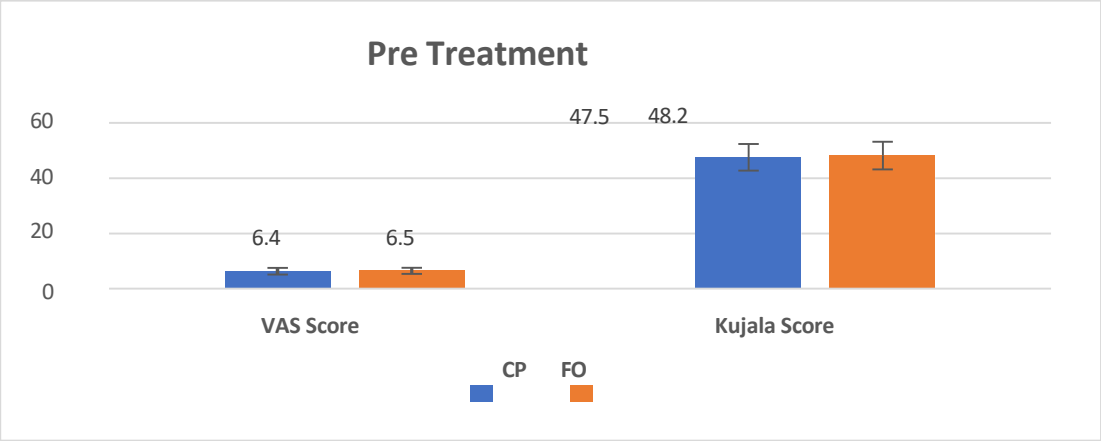
RESULT ANALYSIS

Pre-Treatment Data

- Pain and functional scores were comparable across groups:

VAS Scores: CP = 6.4 ± 1.2; FO = 6.5 ± 1.1 (p=0.82p = 0.82p=0.82).

Kujala Scores: CP = 47.5 ± 4.8; FO = 48.2 ± 5.0 (p=0.68p = 0.68p=0.68).

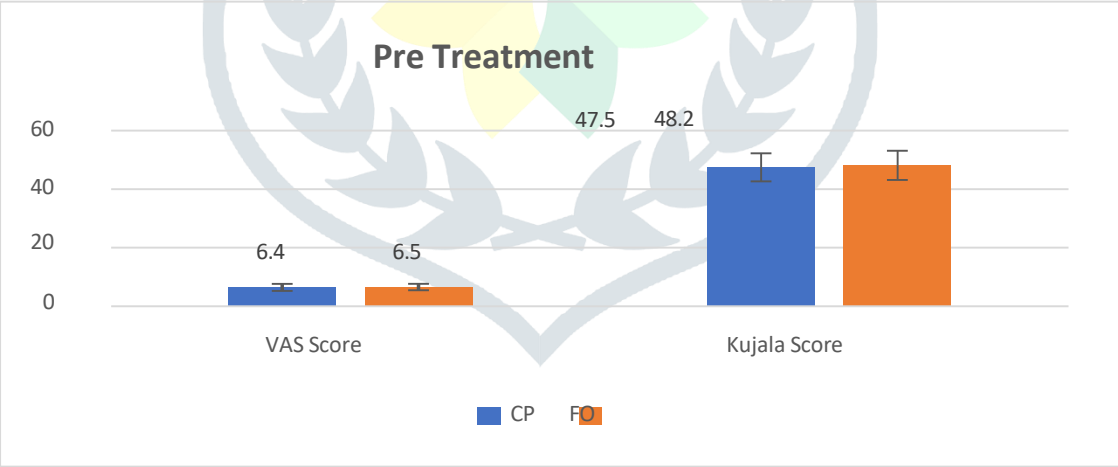


Post-Treatment Data

- **Pain Reduction:**

CP Group: VAS reduced to 2.2 ± 0.9 (p < 0.001p < 0.001p< 0.001).

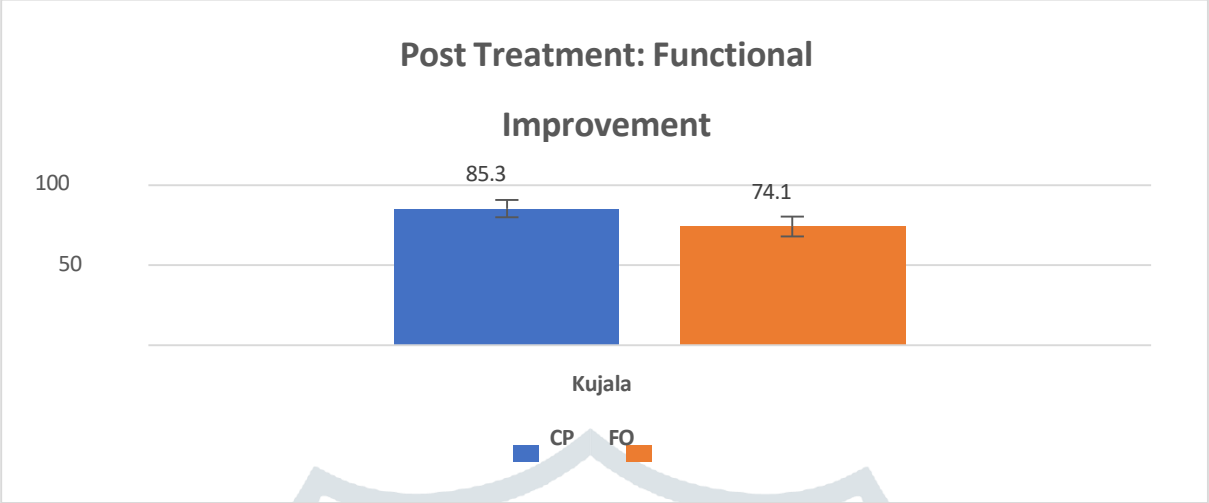
FO Group: VAS reduced to 3.8 ± 1.0 (p < 0.001p < 0.001p< 0.001)



- **Functional Improvement:**

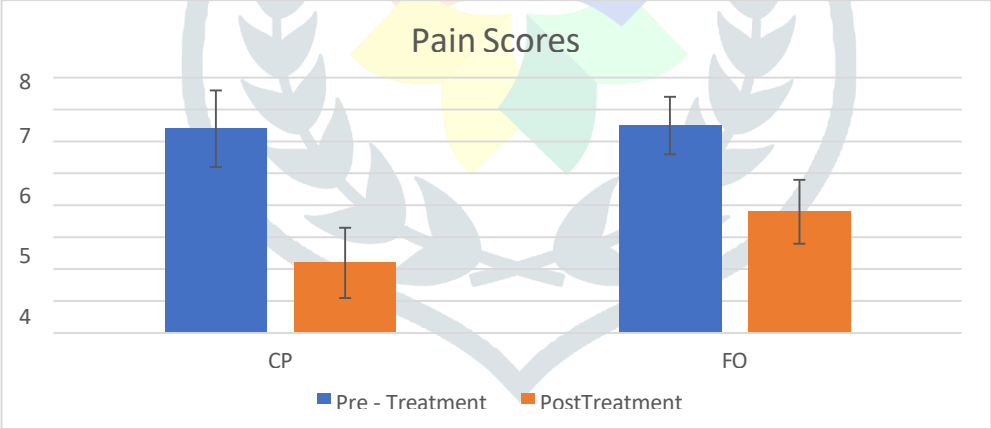
CP Group: Kujala score increased to 85.3 ± 5.4 (p < 0.001p < 0.001p< 0.001).

FO Group: Kujala score increased to 74.1 ± 6.2 ($p < 0.001$ $p < 0.001$ $p < 0.001$).



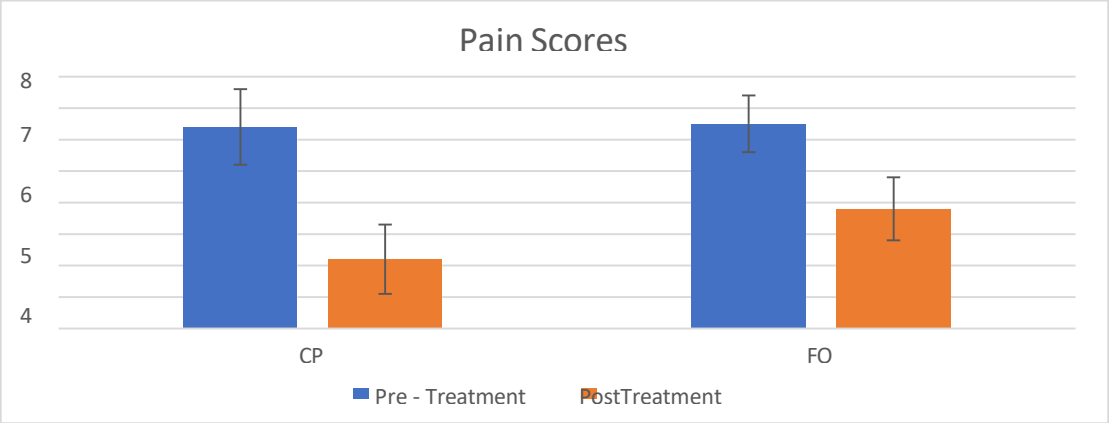
Pain Scores (VAS)

Group	Pre-Treatment	Post-Treatment	% Improvement
CP	6.4 ± 1.2	2.2 ± 0.9	65.6%
FO	6.5 ± 1.1	3.8 ±1.0	41.5%



Functional Scores (Kujala)

Group	Pre-Treatment	Post-Treatment	% Improvement
CP	47.5 ± 4.8	85.3 ± 5.4	79.6%
FO	48.2 ± 5.0	74.1 ± 6.2	53.7%



Discussion

According to the study's findings, foot orthosis (FO) are less successful than conventional physiotherapy (CP) in treating patellofemoral pain syndrome (PFPS), especially when it comes to long-term pain alleviation and functional rehabilitation. CP's ability to treat the underlying dysfunctions linked to PFPS was highlighted by its larger increases in Visual Analog Scale (VAS) and Kujala scores. These findings are consistent with other studies that highlight the significance of addressing muscular imbalances and biomechanical adjustments for long-term advantages.[5]

Effectiveness of Conventional Physiotherapy

CP focuses on strengthening weak muscles, especially the vastus medialis oblique (VMO) and hip abductors, in order to treat the underlying reasons of PFPS. According to Ferber et al. (2015)[6], this lessens dynamic knee valgus and enhances patellar tracking, two major factors that contribute to PFPS symptoms. Tight muscles like the hamstrings and iliotibial band can be stretched to reduce excessive lateral patellar stresses, and neuromuscular training can enhance functional stability and proprioception.[2]

Effectiveness of Foot Orthosis

By shifting load and correcting excessive pronation, FO reduced stress on the patellofemoral joint during weight-bearing exercises and offered faster initial pain alleviation.[3] However, while functional gains plateau with time, its long-term usefulness is limited due to its incapacity to treat muscular deficiencies and movement dysfunctions.[1]

Conclusion

CP is the recommended treatment for PFPS because of its better long-term results. FO can be used as a supplement to CP and is useful for temporary symptom alleviation, especially for individuals who have serious

foot alignment problems. Future studies should investigate how to best manage PFPS by combining the usage of CP and FO.

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