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Effect of Core Stability Exercise Versus Foam Rolling Exercise on Disabled Patellofemoral Pain Syndrome - A Randomized Trial in Coastal Patients.

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Keywords:

coastal, pain disability, special training, Patellofemoral pain syndrome, core stability, foam rolling

Abstract

Background: Coastal life patients may experience knee pain due to various factors such as injury, arthritis, and physical activity. Environmental factors such as humidity and air pressure changes may also contribute to knee pain. Patellofemoral pain syndrome (PFPS) is a disorder that presents with knee pain that varies from severe to minor discomfort that appears to be caused by the interaction of the patella's posterior surface with the femur. In the clinical setting, the reported prevalence of patellofemoral problems ranges from 21 to 40%. Women are twice as likely as males to have patellofemoral problems. This syndrome is increasingly prevalent among teens and, to a lesser extent, women. These patients are disabled in such a way that they are not able to do their routine and may ask for others help.

Aim: To determine the effect of core stability exercise and foam rolling exercise on Patellofemoral pain syndrome.

Methods: A quasi experimental study was conducted at Mahatma Gandhi Medical College and Research Institute, Puducherry. 20 participants were selected between the age group of 25 to 45 years and recruited by convenient sampling method. The participants were divided into two groups by using odd and even method. Group A received Core stability exercise and Group B received foam rolling exercise. The outcome measure was visual analogue scale and Lower extremity functional scale.

Results: The data revealed a statistically significant difference (p0.05) between the two groups, proving that core stability exercise is more beneficial than foam rolling exercise in lowering pain and improving functional abilities.

Conclusion: This study concluded that core stability exercise showed more significant effect on reducing pain and improving functional performance than compared to foam rolling exercise in treating patellofemoral pain syndrome. Foam rolling exercise was also effective but core stability exercise showed better effects. Such disabled coastal population needs better care with unique treatment schedules.

1. Introduction

Coastal life patients may experience knee pain due to various factors such as injury, arthritis, and physical activity. Environmental factors such as humidity and air pressure changes may also contribute to knee pain. Patellofemoral pain syndrome (PFPS) is a disorder that presents with knee pain that varies from severe to minor discomfort that appears to be caused by the interaction of the patella's posterior surface with the femur .In the clinical setting, the reported prevalence of patellofemoral problems ranges from 21 to 40%. Women are twice as likely as males to have patellofemoral problems.

Although several intrinsic and extrinsic causes have been proposed, the etiology of this illness is still unknown. The most widely recognized theory about

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the cause of patellofemoral pain syndrome is based on increased patellofemoral joint pressure as a result of inadequate patellar tracking. A typical reason of knee joint discomfort in young adults is an imbalance in the muscles around the knee, which affects the patella (knee cap) and cartilage in the joint. Patellofemoral pain syndrome (PFPS) is the medical term for this condition, which is often known as runner's knee or a "tracking" problem. Tensor fasciae latae, hamstrings, quadriceps and soleus muscles are also less flexible. Patellofemoral pain syndrome is characterised by knee pain, particularly when sitting with bent knees, clicking, mild swelling, a sense of instability, crouching, leaping, or using the stairs (particularly moving downstairs). Occasional knee buckling occurs when the knee unexpectedly and abruptly gives way and no longer supports the body weight.

Several conservative therapies have been recommended as a result, such as quadriceps strengthening, patellar taping, stretching, and biofeedback. However, no single technique has been demonstrated to be the most successful, and the outcomes of numerous therapy modalities have been inconsistent [1].

Core stability concentrates on strengthening the muscles around your pelvis and tummy. Your pelvis serves as the stable foundation from which your legs move, thus you require adequate muscular control of it. Without a solid pelvis, the forces moving through your legs may be excessive and unpredictable, which may result in damage. Everyone, from senior citizens to elite athletes, benefits from core stability [3].

Together with flexibility, strength, and aerobic training, exercises for core stabilization can be incorporated into any conditioning regimen. Core stability helps you learn to use your inner muscles before you start moving by strengthening the muscles in your core. The emphasis is on breathing, stability, and fluid, coordinated movement [4].

Foam rolling is a sort of self-massage that uses a device called a foam roller to relieve tight and aching muscles. The range of motion and stiffness of muscles may be improved by foam rolling .Recent studies have shown that foam rolling is a useful technique for enhancing flexibility, subjective markers of recovery, and athletic performance, even if much more research is needed to fully understand its effects. Several fitness enthusiasts utilize foam rolling [5]. Decide which muscle group wish to target before using a foam roller .After that, balance on the foam roller while concentrating on the muscle part want to work. Using arms and legs to offer stability and control, slowly roll your body back and forth over the muscle's length. Foam rolling benefits include easing pain, reduces inflammation that develops during the process of muscle regeneration, helps with muscle regeneration and repair maintains muscular length and relieves stress and tightness to aid in injury prevention. Increases blood flow and suppleness in the body's connective tissue, muscles, and joints, which improves mobility, general health, and the look of fat beneath the skin.

People perceptions of pain can differ greatly from one another in humans. Core stability places a lot of focus in to provide a stable base for lower kinetic chain motion . The cornerstone of trunk dynamic control is described as core stability, which facilitates the creation, transfer, and regulation of movement and force to the terminal segments of the lower body kinetic chain. It also involves breathing , stability and co-ordinated movement. It makes essential to acess the effectiveness of these principles on pain reduction and functional performance of the individual against foam rolling exercise which focuses only on reduce pain and increase range of motion by improving flexibility and mobility in the mucles . Hence this study involves the effectiveness of core stability and foam rolling in pain and functional performanance of the individual.

2. Methodology:

It is a quasi-experimental study in order to find out the effect of core stability exercise versus foam rolling exercise on patellofemoral pain syndrome. 20 participants who were diagnosed with patellofemoral pain syndrome from the department of orthopaedics were recruited and enrolled on the basis of selection criteria. Participants included for the study were both male and female who aged between 25 and 45 and diagnosed with patellofemoral pain syndrome, who had anterior knee pain for more than 4 weeks, Peri/retropatellar pain while walking down or upstairs, running, squatting, sitting with knees flexed for an extended period of time,and who had positive clarke's test . The participant who had history of trauma ,fracture of spine and lower extremity, any congenital deformity,osteoarthritis,rehumatoid arthritis ,any surgical procedure involving lumbar or lower

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extremity, any neurological disease, ligamentous Bursitis,,Patellar dislocation.,Chondral defect and Pregnant females, athletes were excluded from this study . Informed consent was obtained from the participants. A total of 20 participants who statisfied the selection criteria were divided into two groups i.e group A (core stability) group B (foam rolling) by odd even method. Each group consists of 10 participants group A (n=10) and group B (n=10). The pre test of pain and functional disability was assessed by using Visual analog scale (VAS) and Lower extremity functional scale (LEFS) before initiating the exercise programme. Before starting these exercises the conventional therapy (TENS) was given for 10 minutes during the first week of exercise programme . Group A received core stability exercise includes prone plank, side plank , Bridging,Quadriceps stretch, Hamstring stretch, side lying straight leg raises, Quadruped arm/leg extension. where group B received foam rolling exercise which includes Hamstrings, Glutes, Quadriceps,IT Band ,Calf. These exercise protocol where carried out for a period of 6 weeks. Each session lasted for 40 minutes including warm up and cool down period, 5 days per week for 6 weeks.

Treatment procedure:

In this study, the treatment procedure involved 2 different exercise interventions core stability exercise and foam rolling exercise.

Before starting these exercise the conventional therapy (TENS) was given for 15 minutes during the first week of exercise programme.

Participants in Group A (core Stability)received their respective exercise interventions for 6 weeks with 2 sets of 15 repetitions for 5 sessions per week, and each session lasting 40 minutes.

Participants in Group B (foam rolling) received their respective exercise interventions for 6 weeks with 2 sets and hold for 30 seconds for 5 sessions per week , and each session lasting 40 minutes

Core stability group (Group A) consists of 10 subjects were received Core stability exercise. The core stability exercise are prone plank , quadriceps stretch , hamstring stretch , bridging, side plank, side lying straight leg raises, quadruped arm/leg extension.

Foam rolling exercise (Group B) consists of 10 subjects were received foam rolling exercise. The foam rolling exercise are hamstrings, glutes, quadriceps, IT band , calf.

Conventional therapy

Traditional mode TENS (high-frequency) has been utilised with four electrodes. The current had a frequency of 60-120 Hertz. A single pulse lasted 20-60 seconds. The intensity gradually increased until the participant felt a severe tingling sensation. The treatment lasted 15 minutes.

Figures

Figure 1 : Quadriceps Stretch

Figure 3: Glutes

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Figure 2: Hamstring Stretch

Figure 4: Quadriceps

Outcome measures

The outcome parameters was pain intensity measured by VAS and functional disability measured by Lower extremity functional scale questionnaire. Assessment of all outcome parameters was done on the first day before starting the treatment and after completion of the last treatment session.

Pain

Visual Analog scale for pain (VAS- P)

The intensity of pain was assessed using the visual analog scale (VAS)

It is a valid and reliable measure to report pain.

It has a 100 mm horizontal line with the left end of the line labelled as no pain and the right end as severe pain.

Lower extremity functional scale

The lower extremity functional scale is a 20-question questionnaire that assesses a person's ability to do daily tasks. Clinicians can use the lower extremity functional scale to assess patients' initial function, ongoing progress, and outcome, as well as to create functional goals.They discovered a mean LEFS score of 71, indicating that their treatment was effective.

3. Statistical Analysis

The statistical analysis was performed using SPPS16 software. All result are presented together with the mean and standard deviation. All the outcome measure baseline scores were displayed. A paired t test was used for all the outcome measure to compare within group change . A unpaired t test was used for all the outcome measure to compare between group change for pre intervention changes and post intervention changes on day 1 and at the end of 6 week.

4. Result :

Table -1: Interpretation of the result

The mean and standard deviation of VAS of Group A and Group B measured before the treatment (Pre) .The Mean of VAS in Group A was 7.40 and in Group B was 7.20.The standard deviation of VAS in Group A was ± 1.35 and in Group B was ±1.4. After analyzing the pre VAS data of both group , obtained t – value is 0.3252 and P- value is 0.7488. The result showing not statistically significant difference in the VAS scores of Group A and Group B.

Table -2: Interpretation of the result

The mean and standard deviation of LEFS of Group A and Group B measured before the treatment (Pre) .The Mean of VAS in Group A was 45.8750 and in Group B was 44.1250 .The standard deviation of LEFS in Group A was ± 18.675 and in Group B was ±17.446. After analyzing the pre LEFS data of both group , obtained t – value is 0.2165 and P- value is 0.8310. The result showing not statistically significant difference in the LEFS scores of Group A and Group B

Table -3: Interpretation of the result

the mean and standard deviation of VAS of Group A and Group B measured after the treatment (Post). The mean of VAS in Group A was 2.4 and in Group B was 4.8. The standard deviation of VAS in Group A was ± 1.280 and in Group B was ±1.469. After analyzing the post VAS data of both group , obtained t value is 3.8944 and P value is 0.0011 ($P<0.05$). The result

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showing significant difference in the VAS scores of Group A and Group B after 6 weeks of treatment.

Table -4: Interpretation of the result

The mean and standard deviation of LEFS of Group A and Group B measured after the treatment (post) .The mean of LEFS in Group A was 74.125 and in Group B was 61.875. The standard deviation of LEFS in Group A was ± 10.414 and In Group B was ± 14.877. After analyzing post LEFS data of both group , obtained t-value is 2.1332 and p – value **is 0.0469 (p< 0.05) .** The result showing significant difference in the LEFS scores of Group A and Group B after 6 weeks of treatment.

TABLE -1: Analysis of Pre test VAS- Group A and B

S.No	*Details*	*Mean*	*S.D*	*t-value*	*p-value*
1.	PRE VAS	7.40	1.35	0.3252	0.7488
2.	PRE VAS	7.20	1.4		

TABLE-2: Analysis of Pre-test LEFS – Group A and B

S.No	Details	Mean	S.D	t-value	p-value
1.	PRE LEFS	45.8750	18.675	0.2165	0.8310
2.	PRE LEFS	44.1250	17.446		

TABLE-3: Analysis of Post test VAS – Group A and B

S.No	Details	Mean	S.D	t-value	p-value
1.	Post VAS	2.4	1.280	3.8944	0.0011
2.	Post VAS	4.8	1.469		

TABLE-4: Analysis of Post test LEFS – Group A and B

S.No	Details	Mean	S.D	t-value	p-value
1	Post LEFS	74.125	10.414	2.1332	0.0469
2	Post LEFS	61.875	14.877		

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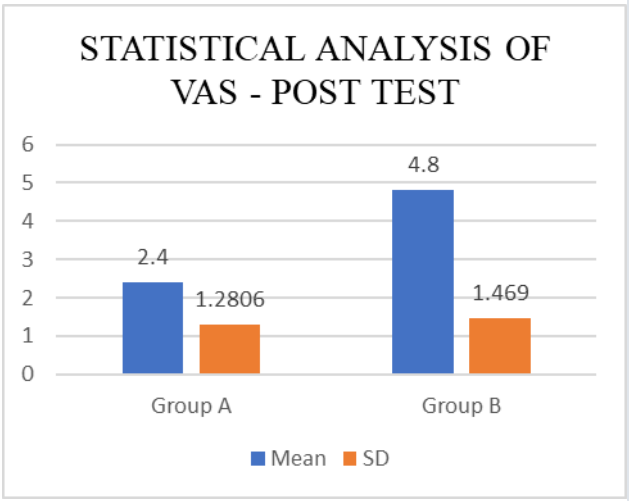
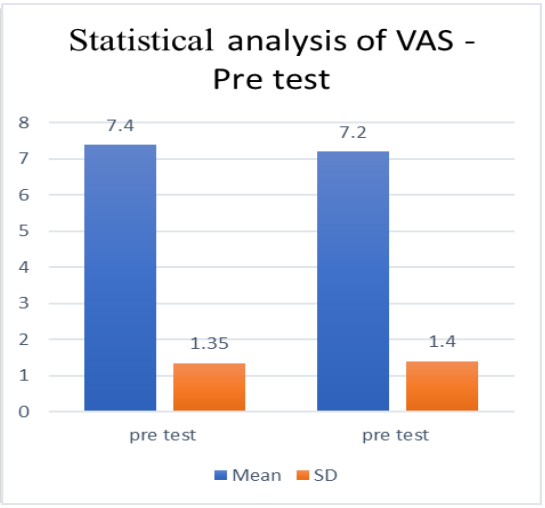
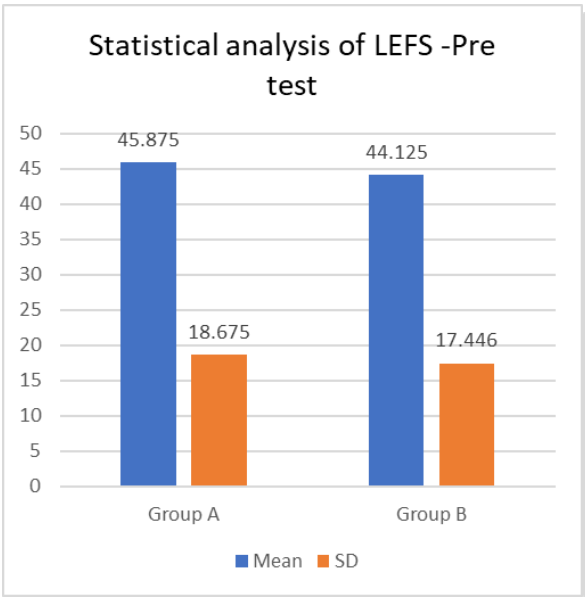
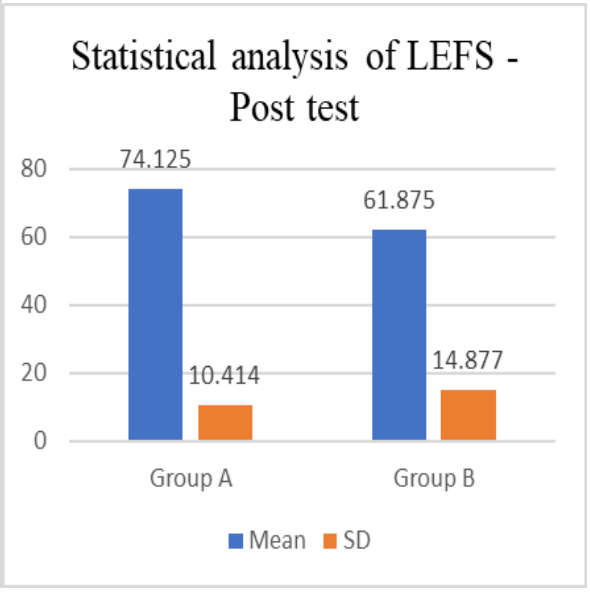




Graph 1: Pre test Comparison of VAS between group A and group B

Graph 2: Pre test Comparison of LEFS between group A and group B





Graph 3: Post test Comparison of VAS between group A and group B

Graph 4: Post test Comparison of LEFS between group A and group B

5. Discussion

The main aim of the current study was to compare core stability exercise and foam rolling exercise on patellofemoral pain syndrome to reduce pain and improves functional performance.

Patellofemoral Pain Syndrome has a complex pathogenesis. These elements include both inherent and extrinsic risk elements, such as muscle and soft tissue abnormalities and lower extremity malalignment. Modifications in frequency of training or magnitude, training surfaces, and improper shoe wear are a few instances of extrinsic risk factors. Due to a confluence of biomechanical issues, muscular imbalances, and soft tissue issues, the patella might not track appropriately in the trochlea of the femur. This may eventually lead to pain at the patello femoral joint from increased stress. [2].Therefore, cartilage and subchondral bone microdamage, inflammation, and discomfort may develop [22].Increased Patellofemoral joint stress has been seen in patients with

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Patellofemoral pain syndrome, supporting the idea that this eventually results in more cartilage And Subchondral bone tension gradually damages the bones and causes pain . The lateral retinaculum , synovium ,medial Patellofemoral ligament and fat pad of Hoffa can also paly a role in Patellofemoral pain Syndrome [23] [24].

Individuals with patellofemoral pain syndrome between the ages of 25 and 45 were enrolled in the present research.Core stability and foam rolling have been compared for their efficacy in treating individuals with patellofemoral pain syndrome. Both groups received the same treatment, TENS. After a 6-week treatment period, both groups displayed improvements in their functional performance as measured by the VAS and LEFS, respectively, and their pain scores..

In our study core stability exercise was given for 6 six weeks and the outcomes was pain and functional performance. This is similar to the study done by Diviya, mercy Clara et al . The effectiveness of two active interventions- Hip strengthening with core stabilization exercise and knee strengthening exercise and discovered that the hip core strengthening exercise was found to have greater effect in relieving pain and improving functional performance in patients with patellofemoral pain syndrome and however, the result of the both studies were same [1].

The core of the body is defined as the spine, abdominal area, pelvis, hips, and proximal lower extremities. It has been demonstrated in numerous situations that strengthening the core muscles has positive management benefits. When there is hip weakness and core instability, the knee is the joint that is most frequently damaged. Injury to the tibiofemoral or patellofemoral joints may result from insufficient regulation of the body's "core" neuromuscular system, which may impact the stability of the lower extremity. The proximal stability of the knee joint is consequently improved by increasing the strength of the central stabilizing muscles.

In this present study foam rolling and conventional therapy (TENS) has been used in patients with patellofemoral pain syndrome. This is similar to the study done by Vaidya SM. The effectiveness of two active intervention –Foam rolling and conventional treatment (stretching) has been compared in patients with patellofemoral pain syndrome and concluded both groups are effective in improving knee ROM and functional status [5].

Foam rolling is a simple method for enhancing recovery, flexibility, and athletic performance. Foam rolling benefits include easing pain, reduces inflammation that develops during the process of muscle regeneration, helps with muscle regeneration and repair maintains muscular length and relieves stress and tightness to aid in injury prevention. Increases blood flow and suppleness in the body's connective tissue, muscles, and joints, which improves mobility, general health, and the look of fat beneath the skin [5].

Consequently, statistical analysis reveals that people in Group A who were given core stability witnessed significantly more pain relief and improved functional activity than individuals in Group B who were given foam rolling exercise.

In this study, core stability were found to be beneficial for treating patients with patellofemoral pain syndrome, even though there was no statistically significant difference in pre-test mean VAS scores between Group A (core stability) and Group B (foam rolling). The post-test mean value revealed a significant difference between group A (core stability), 3.30, and group B, 4.80, after the conclusion of the treatment session. VAS displays superior results in group A (core stability) than group B (foam rolling).

In this study , core stability exercises are helpful for treating patients with patellofemoral pain syndrome including the pre test mean value LEFS between Group A (core stability)45.8750 and Group B(foam rolling) 44.1250 did not show a significant difference. At the end of the treatment session , the post test mean value showed a significant difference between group A (core stability) 74.1250 and group B (foam rolling) 61.8750. In group A (core stability) LEFS shows better result than group B (foam rolling).

Humans experience pain in a variety of ways that might be very different from one another. A lot of emphasis is placed on core stability in order to give lower kinetic chain action a strong foundation. To produce, transfer, and control force and motion to the terminal segments of the lower body kinetic chain, one must have core stability, which is the basis of trunk dynamic control. . It also involves breathing , stability and co-ordinated

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movement. It makes essential to acess the effectiveness of these principles on pain reduction and functional performance of the individual against foam rolling exercise which focuses only on reduce pain and increase range of motion by improving flexibility and mobility in the mucles . Hence this study involves the effectiveness of core stability and foam rolling in pain and functional performanance of the individual.

The study's finding were statistically supported by the described data, such as mean and standard deviation, which showed that both groups had improved in terms of pain relief and improves functional performance by the end of the treatment. When the study's findings from the two groups were compared , core stability exercise (A) demonstrated much greater benefits than foam rolling exercise group (B). Even though there are a lot of approaches [30-33]to management of chronic pain, we suggest a non drug approach to counter the same.

6. Recommendation

- A study of this kind can be done with larger sample in future for better outcome.
- The variables studied were only pain and functional activity , while the other variables related in Patellofemoral pain syndrome were not considered.
- The study can be done with Different duration of training program
- To evaluate the effects of the same exercise in various other age groups.

7. Conclusion:

Coastal life patients may experience knee pain due to various factors such as injury, arthritis, and physical activity. Environmental factors such as humidity and air pressure changes may also contribute to knee pain. At the conclusion of the current investigation, group A demonstrated a significantly reduction in the pain and improving functional performance as compared to group B based on the mean value obtained from the post test values between group A(core stability exercise) and group B (foam rolling exercise) . Hence it can be concluded based on the mean value the core stability exercise proved to be better choice of exercise for patellofemoral pain syndrome than compared to foam rolling exercise.

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Author Contribution Statement:

Text preparing, Data collection and Result by Suganya S. Communication, design and concept by Srinivasan M .Overall supervision and design suggestion by Shanmugananth.E

Conflict of Interest:

None.- Ethical issues – addressed

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