TO COMPARE THE EFFECTIVENESS OF CONVENTIONAL THERAPY AND PLYOMETRIC TRAINING ON IMPROVING JOINT STABILITY IN ATHLETES FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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ABSTRACT

Anterior cruciate ligament (ACL) reconstruction is commonly performed in athletes to restore knee stability and function. Post-surgical rehabilitation plays a crucial role in improving joint stability and enabling safe return to sports. Conventional therapy focuses on range of motion, muscle strengthening, and proprioceptive training, whereas plyometric training emphasizes explosive, sport-specific movements that enhance neuromuscular control. However, limited evidence exists comparing the effectiveness of these two rehabilitation approaches on joint stability following ACL reconstruction. This study was a comparative study conducted on 30 athletes who underwent ACL reconstruction. Subjects were randomly divided into two groups: Group A received conventional therapy and Group B received plyometric training. Both groups underwent intervention for 6 weeks, 3 sessions per week. Outcome measures such as Single Leg Hop Test, VAS scale, and Lysholm Knee Score were assessed before and after the intervention. Both groups demonstrated highly significant pre- to post-test improvements ($p<0.001$). Hence, the null hypothesis was rejected, indicating superior effectiveness of Group B intervention. Both therapies improved outcomes after ACL reconstruction, but plyometric training showed significantly better results. Hence, it is more effective for improving joint stability and functional recovery.

KEYWORDS:

ACL reconstruction, Conventional therapy, Plyometric training, Joint stability, Athletes, Rehabilitation, Knee function.

INTRODUCTION

Anterior cruciate ligament (ACL) is an essential structure of the knee joint that contributes significantly to both static and dynamic stability during movement. It plays a critical role in transmitting sensory information related to knee position and movement to the central nervous system through specialized mechanoreceptors located within the ligament. Due to the high physical demands placed on the knee during

sporting activities, the ACL is particularly susceptible to injury, with a reported annual incidence of approximately 69 cases per 100,000 individuals[1].ACL injuries are common among athletes participating in high-intensity sports that involve jumping, landing, cutting, and rapid directional changes. Risk factors associated with ACL injuries include inadequate knee flexion during landing, excessive valgus positioning of the knee, and high ground reaction forces during dynamic movements. Studies have also shown that female athletes experience a higher rate of non-contact ACL injuries compared with males in similar sports disciplines[2].Anterior cruciate ligament reconstruction (ACLR) is widely recognized as the standard surgical intervention for individuals who sustain ACL rupture, particularly among physically active populations[2]. The primary objective of this procedure is to restore mechanical stability of the knee joint and enable athletes to return to their pre-injury level of physical performance[1].These proprioceptive deficits can compromise joint stability and increase the risk of functional instability during athletic activities[5]. These programs generally extend over a period of four to nine months to allow adequate restoration of functional capacity. Exercise-based rehabilitation strategies have increasingly incorporated neuromuscular training techniques aimed at enhancing joint stability and preventing further injury[5]. Among these methods, plyometric training has gained attention due to its ability to improve explosive strength, coordination, and neuromuscular control[6]. Such exercises involve rapid stretch shortening cycles of muscles, which can enhance the functional performance of athletes during dynamic activities[6].Eccentric and concentric strengthening exercises are also commonly included in rehabilitation programs to restore muscle strength and improve joint function following ACL surgery[7].Previous studies have demonstrated that progressive strength training programs can lead to improvements in functional performance measures such as vertical jump height and single- leg hop distance[8]. These improvements highlight the importance of targeted exercise interventions in facilitating recovery after ACL reconstruction[8].Despite the growing body of research examining different rehabilitation strategies following ACL reconstruction, the optimal training method to improve joint stability and functional performance remains a subject of ongoing investigation[9]. Some studies have suggested that advanced training methods such as plyometric or combined eccentric-plyometric exercises may produce superior improvements in dynamic balance and functional outcomes[10]. These findings indicate that incorporating specialized exercise modalities into rehabilitation programs may enhance recovery in athletes following ACL surgery [(10)].Functional instability following anterior cruciate ligament injury is not solely due to mechanical insufficiency but is also influenced by deficits in neuromuscular coordination[6]. Conventional rehabilitation programs typically include exercises such as quadriceps strengthening, hamstring activation, and balance training to restore knee function[5]. These exercises are designed to improve joint stability through gradual progression of load and intensity[6]. However, such programs may not fully replicate the high-speed and complex movements required in sports[6].Plyometric training, which involves explosive movements such as jumping and hopping, has been identified as an effective method to enhance neuromuscular performance[7]. These exercises stimulate rapid muscle contractions and improve the efficiency of the stretch shortening cycle[7]. Consequently, plyometric training can contribute to improved dynamic stability and functional performance in athletes[8].The incorporation of plyometric exercises into post-ACL reconstruction rehabilitation has shown promising results in improving functional outcomes[8].

AIM OF THE STUDY:

To improve joint stability using conventional therapy and plyometric training exercises has been given as comparison for athletes following anterior cruciate ligament reconstruction.

OBJECTIVES OF THE STUDY:

- To evaluate the effect of conventional therapy on knee joint stability following ACL reconstruction.
- To evaluate the effect of plyometric training on knee joint stability following ACL reconstruction.
- To evaluate the effect of conventional therapy versus plyometric training on knee joint stability following ACL reconstruction

BACKGROUND OF THE STUDY:

Elie Hajouj et al., (2021) concluded that conventional rehabilitation alone improves pain and knee function, but combined specialized proprioceptive exercise produces better joint stability outcomes.Sofien kasmi et al., (2021) found that plyometric training significantly improves dynamic balance, neuro muscular control, return to sport index, lysholm knee score and leg symmetry index in lite athletes after ACL reconstruction.

NEED OF THE STUDY:

Although conventional therapy is routinely used after ACL reconstruction, some athletes continue to demonstrate reduced balance, altered movement patterns, and incomplete functional recovery. plyometric training may stimulate faster neuromuscular adaptation through stretch-shortening cycle activities improve joint control during sports-specific movements. Since both rehabilitation methods are commonly used, comparing their effectiveness is necessary to identify which approach produces better improvement in joint stability in athletes after ACL reconstruction. This may help clinicians design more effective rehabilitation protocols and improve return to sport outcomes.

HYPOTHESIS

NULL HYPOTHESIS:

There will be no significant difference between conventional therapy and plyometric training in improving joint stability in athletes following anterior cruciate ligament reconstruction.

ALTERNATIVE HYPOTHESIS:

There will be a significant difference between conventional therapy and plyometric training in improving joint stability in athletes following anterior cruciate ligament reconstruction, plyometric training has expected to provide greater improvement in stability for knee joint.

REVIEW OF LITERATURE:

1. **Kasmi s et al. (2023)** Reported that 6-week plyometric program performed twice weekly significantly enhanced neuromuscular control and lower limb symmetry in post ACL reconstructed athletes, indicating the importance of explosive exercise during advanced rehabilitation.
2. **Elie hajouj et al. (2021)** The study concluded that combining proprioceptive challenges with conventional therapy will accelerates the stability of knee joint.
3. **Saki f et al. (2023)** conducted a study on core stabilization and neuromuscular training in athletes following ACL reconstruction. The intervention was carried out for 6 to 8 weeks, and the results showed improved neuromuscular function and better joint stability during dynamic activities.
4. **Buckthorpe M et al. (2022)** provide clinical recommendations on plyometric training following ACL reconstruction. The study emphasized that progressive plyometric exercises improve neuromuscular control, movement quality, and joint stability.

5. **Parab S et al. (2024)** conducted a case study on low to moderate plyometric training after ACL reconstruction. The intervention was carried out for 8 weeks, and results showed improvement in knee stability, rage of, and functional joint stability.
6. **Shedge S et al. (2024)** conducted a case report on plyometric training in a badminton athlete following ACL reconstruction. The intervention lasted for 6 to 8 weeks, and the results showed significant improvement in knee stability, agility, and return-to-sport performance.
7. **Meena A et al. (2024)** conducted a review on ACL reconstruction outcomes in athletes. The study highlighted that advanced rehabilitation techniques including plyometric and neuromuscular training improve joint stability and reduce re-injury risk.
8. **Hao F et al. (2025)** conducted a meta-analysis on the effects of plyometric training after ACL reconstruction. The included studies ranged from 6 to 12 weeks, and results suggested that plyometric training improves neuromuscular function, strength, and dynamic joint stability, though further high-quality trials are needed.
9. **Wilk K.E et al. (2024)** conducted a clinical commentary on neurocognitive and neuromuscular rehabilitation following ACL reconstruction. The study emphasized early and progressive rehabilitation strategies to improve joint stability and functional recovery.
10. **Gokeler A et al. (2023)** conducted a study on movement retraining programs in ACL reconstructed athletes. The intervention lasted for 6 to 8 weeks, and results showed improvement in movement symmetry and dynamic joint stability.

METHODOLOGY:

STUDY DESIGN: comparative study
STUDY SETTING: Sri Isari Velan Mission Hospital, Thalambur, Chennai
SAMPLE SIZE: 30 subjects
SAMPLE METHOD: convenient sampling
STUDY DURATION: 6 weeks

INCLUSION CRITERIA:

Age 18-35 years
Unilateral ACL reconstruction
Knee flexion >100 and full extension
Regular sport participation before injury

EXCLUSION CRITERIA:

Bilateral ACL injury
Previous lower limb fracture or surgery
Post operative complications
Pain during assessment
Neurological disorders

OUTCOME MEASURES:

Single leg hop test

VAS scale

Lysholm knee scalePROCEDURE:

In this comparative study, 30 subjects who fulfilled the inclusive criteria and exclusive criteria were selected. Baseline assessment was performed before the intervention using selected outcome measures including dynamic balance, functional performance and knee function.The participants had undergone anterior cruciate ligament reconstruction and completed the initial plane of rehabilitation prior to inclusion in the study.

The subjects were then randomly allocated into two groups:

- Group A - (15 subjects) were gone for conventional therapy group
- Group B - (15 subjects) were gone for plyometric training group

Both groups perform exercise minutes sessions a week for a duration of weeks. The pre–test had been taken by using the outcome measures.

PRE INTERVENTION ASSESSMENT:Before initiating the intervention, all subjects were undergoing baseline assessment for outcome measures.

GROUP A:Conventional therapy group: (Pre-test)

- Neuromuscular control was assessed by using single leg hop test.
- Knee physical activity was assessed by using lysholm knee score.
- Pain was assessed by using vas scale.

GROUP B:Plyometric training group: (Pre-test)

- Neuromuscular control was assessed by using single leg hop test.
- Knee physical activity was assessed by using lysholm knee score.
- Pain was assessed by using VAS scale.

INTERVENTION

All the subjects included in this study underwent a structured rehabilitation program following anterior cruciate ligament reconstruction. The total duration of intervention was 6 weeks, and subjects were divided into two groups:

- Group A – Conventional Therapy Group
- Group B – Plyometric Training Group

Both groups received treatment for 3 sessions per week, and each session lasted approximately 45–60 minutes.

GROUP A:

1. Conventional Therapy Group

The subjects in this group received a standard rehabilitation protocol focusing on restoring knee function, joint stability, muscle strengthening, and range of motion following anterior cruciate ligament reconstruction.

These exercises were performed 3 sessions per week, with gradual progression over 6 weeks.

PHASE 1: (week 1): This phase goal is to reduce stiffness, restore range of motion and activate quadriceps muscle.

- Quadriceps setting exercises (2 sets – 10 reps)
- Straight leg raises (2 sets – 10 reps)
- Heel slides (2 sets – 10 reps)
- Ankle pumps (2 sets – 10 reps)
- Passive knee extension stretches (10 sec hold – 5 reps)
- Hamstring gentle stretch (10 sec hold – 5 reps)

These exercises have been given to reduce pain and muscle activation.

PHASE 2: (Week 2): This phase goal on to improve muscle control and improve weight bearing.

- Continue week 1 exercise
- Assisted mini squats on 30 degrees (3 sets – 10 reps)
- Standing hamstring curls (3 sets – 10 reps)
- Heel raise (3 sets – 10 reps)
- Weight shifting (3 sets – 10 reps)
- Static cycling (low res) - 10 mins

These exercises have been given to improve controlled strengthening and partial loading.

PHASE 3: (Week 3): This phase goal on to improve muscle strength and begin balance training.

- Mini squats progression on 45 degrees (3 sets – 12 reps)
- Step-ups = (3sets – 12reps)
- Step-downs (3sets – 10 reps)
- Single-leg standing (support if needed) = (5 reps – 15 sec hold)
- Resistance band exercises (quadriceps & hamstrings)
- Stationary cycling (15 minutes)

These exercises have been given to improve Joint stability and neuromuscular control.

PHASE 4: (Week 4): This phase goal on to Enhance functional strength and dynamic balance.

- Full squats (within tolerance) = (3 sets – 12 reps)
- Lunges (forward) = (3 sets - 12 reps)
- Step-ups (higher step) = (3 sets – 12 reps)
- Single-leg balance (no support) = (20 sec hold - 5 reps)
- Balance board training (5 minutes)
- Treadmill walking = (10–15 minutes)

These exercises have been given to improve muscle Functional strengthening.

PHASE 5: (WEEK 5): This phase goal is to improve coordination and prepare for dynamic activity

- Squats with resistance (3 sets – 15 reps)
- Walking lunges (3 sets – 12 reps)
- Lateral step-ups (3 sets – 10 reps)
- Single-leg balance with perturbation (5 reps – 20 secs)
- Agility drills (slow pace)
- Brisk walking (15–20 minutes)

This exercise has been given to improve Controlled functional movements.

PHASE 6: (Week 6): This phase goal is to Improve endurance and advanced stability of joint

- Deep squats (3sets – 15 reps)
- Advanced lunges (multi-direction) = (3sets - 12 reps)
- Step drills (forward & lateral)
- Single-leg stance with eyes closed = (3sets - 20 sec)
- Light jogging (if pain-free) = (5–10 minutes)
- Functional task training (stairs, directional changes)

These exercises have been given for Return to pre-injury activity level.

GROUP B:

2. Plyometric Training Group

The subjects in this group received plyometric training aimed at improving stability and functional performance following anterior cruciate ligament reconstruction.

These exercises were performed 3 sessions per week, with gradual progression over 6 weeks.

PHASE 1: (Week 1–2)

Goals:

- Improve proprioception
- Develop landing mechanics
- Initiate controlled plyometric activity
- Double-leg mini jumps (in flat surface)
- Ankle hops (low amplitude)
- Side-to-side weight shifts
- Mini squat jumps (low height)
- Step-up with knee drive (controlled)

Volume:

- 2–3 sets × 10–12 reps
- Rest: 30–60 sec

Key Focus:

- Soft landing (toe → heel)
- Avoid knee valgus
- Maintain knee alignment

PHASE 2: (Week 3–4)

Goals:

- Improve dynamic knee stability
- Increase eccentric control
- Introduce directional movements

Exercises: Jump squats (moderate height)

- Lateral jumps (double-leg)
- Forward bounding (short distance)
- Box step-off → soft landing
- Single-leg balance and perturbation

Volume:

- 3 sets × 8–10 reps
- Rest: 60–90 sec

Progression Criteria:

- No pain/swelling
- Good control during landing
- Symmetrical weight bearing

PHASE 3: (Week 5–6)

Goals:

- Enhance explosive power
- Improve unilateral stability
- Prepare for sports activities
- Single-leg hops (forward)
- Lateral single-leg hops
- Box jumps (higher intensity)
- Drop jumps (controlled landing)
- Tuck jumps

Volume:

- 3–4 sets × 6–8 reps
- Rest: 90–120 sec

Key Focus:

- Knee alignment
- Controlled landing
- Equal limb loading

POST INTERVENTION ASSESSMENT:

After completion of the 6-weeks training program, all participants were reassessed using the same tools for outcome measures

GROUP A:Conventional therapy group: (Pre-test)

- Neuromuscular control was assessed by using single leg hop test.
- Knee physical activity was assessed by using lysholm knee score.
- Pain was assessed by using vas scale.

GROUP B:Plyometric training group: (Pre-test)

- Neuromuscular control was assessed by using single leg hop test.
- Knee physical activity was assessed by using lysholm knee score.
- Pain was assessed by using VAS scale.DATA ANALYSIS

The data were tabulated and analysed using Microsoft excel. Descriptive statistics are used summarizing the data and interferential statistics are used to evaluate the results. Paired t-test was applied for within-group analysis, while independent (unpaired) t-test was used for between group comparison.

TABLE-1

COMPARISON OF SINGLE LEG HOP TEST VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

HOP	Group A		Group B		T-test	Significance
	Mean	Standard deviation	Mean	Standard deviation		
Pre test	73.33	2.58	73.46	2.55	0.2991	0.7671
Post test	76.73	2.63	79.8	3.18	2.8726	0.0077

The above table presents the mean, standard deviation, t value and p value of single leg hop test values between group a and group b at pre test and post test.

The results shows that there was no statistically significant difference between the groups at pre test($p>0.05$), indicating the both groups were comparable at baseline.

However, at post test, a very statistically significant difference was observed between the groups($p<0.01$). Both the groups showed improvement, but Group B demonstrated greater improvement compared to Group A as indicated by the higher mean value.

GRAPH-1

COMPARISON OF SINGLE LEG HOP TEST VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

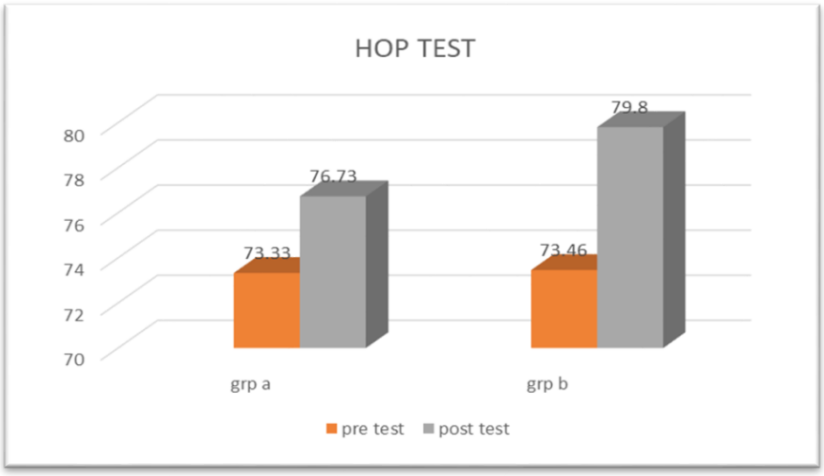


TABLE-2

COMPARISON OF VISUAL ANALOG SCALE VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

VAS	Group A		Group B		T-test	Significance
	Mean	Standard deviation	Mean	Standard deviation		
Pre test	6.06	0.7	6	0.75	0.25	0.8044
Post test	4.93	0.88	3.86	0.83	3.1277	0.0041

The above table presents the mean, standard deviation, t value and p value of VAS values between group a and group b at pre test and post test.

The results shows that there was no statistically significant difference between the groups at pre test($p>0.05$), indicating the both groups were comparable at baseline.

However, at post test, a very statistically significant difference was observed between the groups($p<0.005$). Both the groups showed improvement, but Group B demonstrated greater improvement compared to Group A as indicated by the lower mean value.

GRAPH-2

COMPARISON OF VISUAL ANALOG SCALE VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

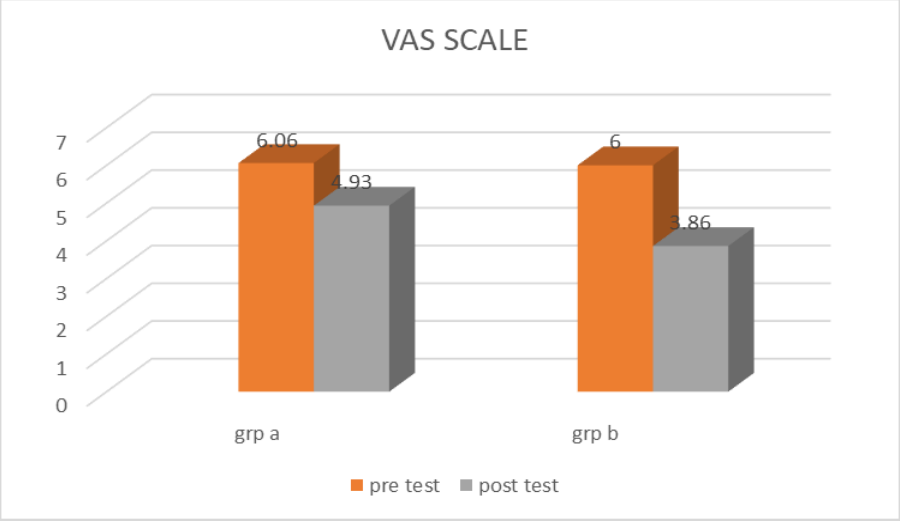


TABLE-3

COMPARISON OF LYSHOLM KNEE SCORE VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

LYS	Group A		Group B		T-test	Significance
	Mean	Standard deviation	Mean	Standard deviation		
Pre test	58.66	2.58	58.8	3.05	0.1292	0.8981
Post test	63.66	3.45	74.86	5.82	6.4003	0.0001

The above table presents the mean, standard deviation, t value and p value of lysholm knee score values between group a and group b at pre test and post test.

The results shows that there was no statistically significant difference between the groups at pre test($p>0.05$), indicating the both groups were comparable at baseline.

However, at post test, a extremely statistically significant difference was observed between the groups($p<0.05$). Both the groups showed improvement, but Group B demonstrated greater improvement compared to Group A as indicated by the higher mean value.

GRAPH-3

COMPARISON OF LYSHOLM KNEE SCORE VALUES BETWEEN GROUP-A AND GROUP-B IN PRE TEST AND POST TEST

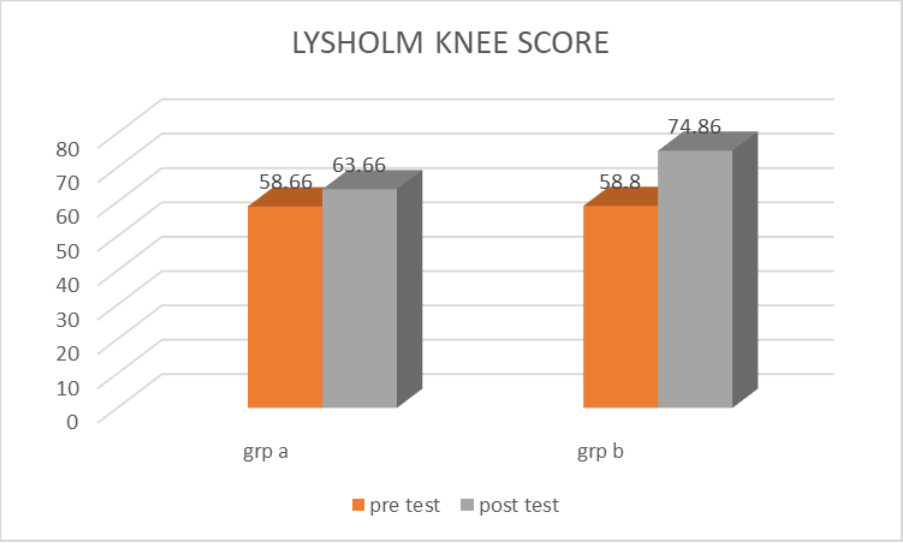


TABLE-4

COMPARISON OF SINGLE LEG HOP TEST, VAS SCALE AND LYSHOLM KNEE SCORE TEST VALUES WITH GROUP-A

Group A	Pre test		Post test		T-test	Significance
	Mean	Standard deviation	Mean	Standard deviation		
HOP	73.33	2.58	76.73	2.63	14.4664	0.0001
VAS	6.06	0.7	4.93	0.88	12.4746	0.0001
LYS	58.66	2.58	63.66	3.45	10.6832	0.0001

The above table presents the mean, standard deviation, t value and p value between pre test and post test within group a

There is a extremely statistically significant difference between the pre test and post test of HOP, VAS, LYS values within group a ($p<0.001$)

GRAPH-4

COMPARISON OF SINGLE LEG HOP TEST, VAS SCALE AND LYSHOLM KNEE SCORE TEST VALUES WITH GROUP-A

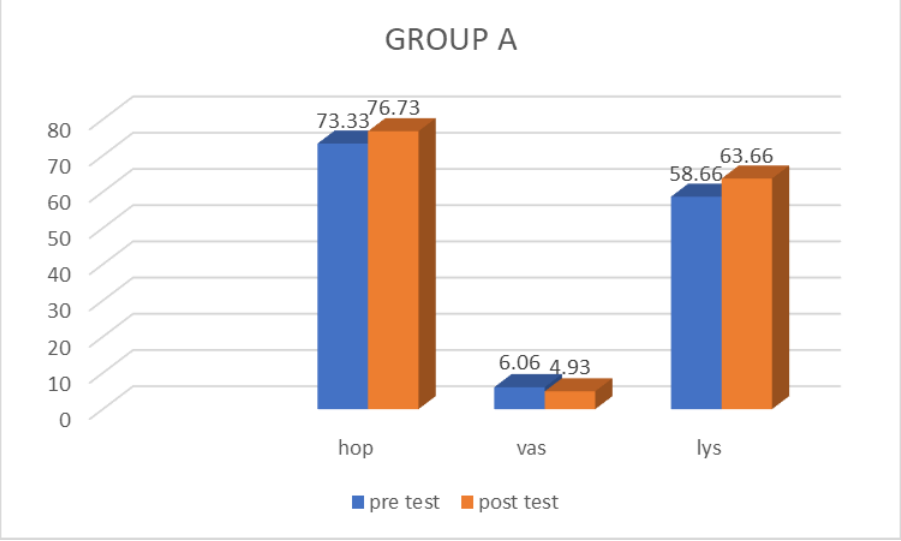


TABLE-5

COMPARISON OF SINGLE LEG HOP TEST, VAS SCALE AND LYSHOLM KNEE SCORE TEST VALUES WITH GROUP-B

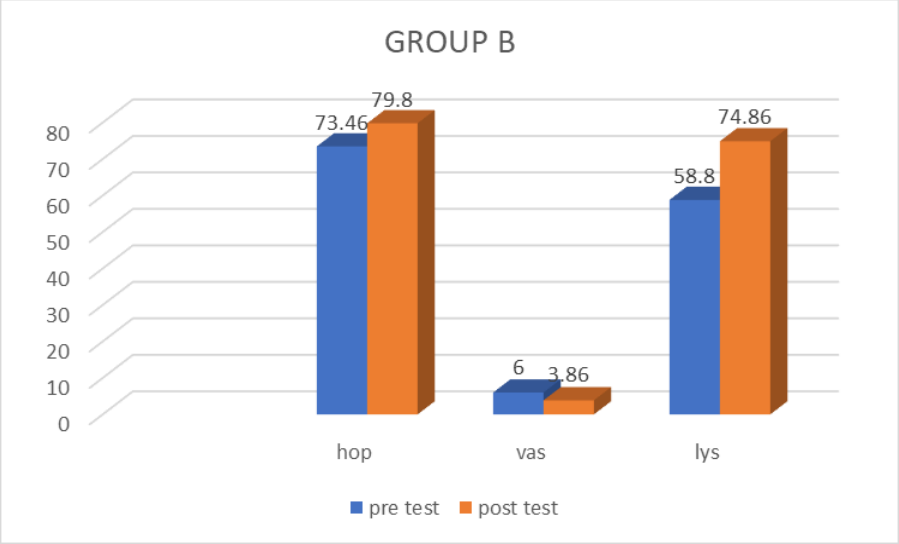
Group B	Pre test		Post test		T-test	Significance
	Mean	Standard deviation	Mean	Standard deviation		
HOP	73.46	2.55	79.8	3.18	15.0208	0.0001
VAS	6	0.75	3.86	0.83	16	0.0001
LYS	58.8	3.45	74.86	5.82	13.4663	0.0001

The above table presents the mean, standard deviation, t value and p value between pre test and post test within group b

There is a extremely statistically significant difference between the pre test and post test of HOP, VAS, LYS values within group b ($p<0.001$)

GRAPH-5

COMPARISON OF SINGLE LEG HOP TEST, VASSCALE AND LYSHOLM KNEE SCORE TEST VALUES WITH GROUP-B



RESULT:

In table 1 the comparison of mean values group a and group b in the hop showed a very statistically significant difference ($p<0.01$), group b demonstrated greater improvement than group a, as indicated by higher mean values. therefore, null hypothesis is rejected.

In table 2 the comparison of mean values group a and group b in the vas showed a very statistically significant difference ($p<0.005$), group b demonstrated greater improvement than group a, as indicated by lower mean values. therefore, null hypothesis is rejected.

In table 3 the comparison of mean values group a and group b in the showed a extremely statistically significant difference ($p<0.001$), group b demonstrated greater improvement than group a, as indicated by higher mean values. therefore null hypothesis is rejected.

In table 4 and table 5, the comparison of mean values of the single leg hop test, vas scale and lysholm knee score measurements between pre test and post test within Group A and Group B showed a highly significant difference($p<0.001$). Therefore, the null hypothesis is rejected.

DISCUSSION:

The present study was conducted to compare the effectiveness of conventional therapy and plyometric training on improving joint stability in athletes following anterior cruciate ligament reconstruction. A total of 30 subjects were selected and divided into two groups: Group A (conventional therapy) and Group B (plyometric training).The findings of this study showed that both groups demonstrated improvement in all outcome measures, including the Single Leg Hop Test, VAS scale, and Lysholm Knee Score after 6 weeks of intervention. However, when comparing between groups, the plyometric training group (Group B) showed greater improvement than the conventional therapy group (Group A).In the Single Leg Hop Test, both groups showed improvement in post-test values, indicating enhanced functional performance and limb stability. However, Group B demonstrated significantly higher improvement compared to Group A, suggesting that plyometric training is more effective in improving dynamic stability and power.

This may be due to the involvement of explosive movements and stretch-shortening cycle activities in plyometric exercises, which enhance neuromuscular coordination.With respect to pain measured using the VAS scale, both groups showed reduction in pain levels post-intervention. However, Group B showed a more significant reduction compared to Group A. This indicates that improved neuromuscular control and functional stability achieved through plyometric training may contribute to reduced stress on the knee joint, thereby decreasing pain.Similarly, the Lysholm Knee Score showed improvement in both groups, reflecting better knee function and activity level. Group B demonstrated greater improvement compared to Group A, indicating that plyometric training enhances overall knee performance more effectively than conventional therapy alone.

The results of this study are supported by previous literature. Studies by Kasmi et al. and Buckthorpe et al. have reported that plyometric training significantly improves neuromuscular control, functional performance, and joint stability following ACL reconstruction. Additionally, Alahmari et al. found that advanced rehabilitation techniques produce better outcomes compared to conventional methods.The probable reason for the superior results in the plyometric group may be due to its sport specific nature, which challenges the neuromuscular system under dynamic conditions.

Unlike conventional therapy, plyometric exercises simulate real-life athletic movements such as jumping, landing, and quick directional changes, thereby improving functional stability more effectively.Thus, the findings of the present study indicate that while conventional therapy is beneficial in early rehabilitation, incorporation of plyometric training provides additional advantages in improving joint stability and functional outcomes.

CONCLUSION:

The present study concludes that both conventional therapy and plyometric training are effective in improving joint stability, reducing pain, and enhancing functional performance in athletes following anterior cruciate ligament reconstruction.

However, plyometric training demonstrated significantly greater improvement compared to conventional therapy in all outcome measures, including Single Leg Hop Test, VAS scale, and Lysholm Knee Score.

Therefore, it can be concluded that plyometric training is more effective than conventional therapy in improving joint stability and functional recovery in post-ACL reconstruction athletes.

Incorporating plyometric exercises into rehabilitation programs may help achieve better neuromuscular control, dynamic stability, and faster return to sports activities.

LIMITATIONS:

- Sample size was small.
- Duration of the study was short (6 weeks).
- Environmental factors
- Long term follow up was not taken
- Limitation in measurement.

RECOMMENDATIONS:

- Larger sample size can be taken for further studies.
- Need more training duration.
- Adding of additional outcome measures to assess functional performance.
- Providing of more methods will be helpful to improve functionalities in joint.

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