



Effectiveness of Maitland Mobilization and Mobilization with Movement on Pain and Limited Dorsiflexion Range of Motion in Basketball Players with Lateral Ankle Sprain: A Comparative Study

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Abstract: Background: Lateral ankle sprains are among the most common sports injuries in basketball players, frequently resulting in pain and restricted ankle dorsiflexion range of motion (ROM). Manual therapy techniques such as Maitland Mobilization and Mobilization with Movement (MWM) are commonly used to improve these impairments, but evidence comparing their effectiveness is limited.

Objective: To compare the effectiveness of Maitland Mobilization and Mobilization With Movement (MWM) in reducing pain and improving dorsiflexion ROM in basketball players with lateral ankle sprain.

Methods: A comparative study was conducted on 50 basketball players aged 18–25 years with acute or subacute Grade I or Grade II unilateral lateral ankle sprain. Participants were allocated into two groups: Group A received Maitland Mobilization, while Group B received Mobilization with Movement. Pain was assessed using the Numeric Pain Rating Scale (NPRS), and ankle dorsiflexion ROM was measured before and after the intervention. Statistical analysis was performed to compare within-group and between-group changes.

Results: In Group A, the mean NPRS score decreased from 4.76 ± 1.10 to 1.44 ± 1.12 , while in Group B it decreased from 4.76 ± 1.21 to 1.68 ± 0.98 . The mean dorsiflexion ROM improved from $15.08 \pm 2.49^\circ$ to $17.12 \pm 1.38^\circ$ in Group A and from $14.60 \pm 2.63^\circ$ to $16.84 \pm 1.55^\circ$ in Group B. Both groups showed statistically significant improvements in pain and dorsiflexion ROM ($p < 0.001$). However, the between-group comparison revealed no statistically significant difference ($p > 0.005$), indicating that both interventions were equally effective.

Conclusion: Maitland Mobilization and Mobilization with Movement are both effective interventions for reducing pain and improving ankle dorsiflexion ROM in basketball players with lateral ankle sprain. Neither technique showed superiority over the other, suggesting that either approach may be selected based on clinical preference and patient needs.

Index Terms - Lateral ankle sprain, Basketball players, Maitland Mobilization, Mobilization With Movement, dorsiflexion range of motion, pain intensity.

I. INTRODUCTION

Ankle sprains are among the most common injuries in basketball players due to the high-intensity movements such as jumping, landing, and rapid direction changes. A 10-year study on collegiate basketball players reported ankle injury rates of 1.45 per 1000 athlete exposures in females and 2.00 per 1000 athlete exposures in males.

Further, it is the most common injury in men's and women's basketball at any level of competition.

The most commonly affected structure was the lateral ligament complex, making lateral ankle sprain the most prevalent type of ankle injury in basketball players.¹

ANATOMY OF ANKLE JOINT

- The term ankle refers specifically to the talocrural joint that is the articulation between the distal tibia and fibula proximally and the body of the talus distally. The ankle is a synovial hinge joint with a joint capsule and associated ligaments. It is generally considered to have a single oblique axis with one degree of freedom around which the motion of plantarflexion and dorsiflexion occur
- The anterior tibiofibular ligament, calcaneofibular ligament and posterior talofibular ligament provide static support to the joint laterally. Whereas the deltoid ligament complex (anterior and posterior tibiofibular ligament), the tibiofibular ligament and the tibionavicular ligament provide medial support.²

ANKLE SPRAIN

- Ankle sprains are common in active people. Majority of this sprain are result from inversion and plantarflexion. Limited dorsiflexion range of motion is common after lateral ankle sprain and should be addressed during rehabilitation.³ The severity of an ankle sprain is typically placed into one of 3 grades based on the amount of ligamentous damage
- Grade I (Mild sprain): No instability, single ligament involved. Minimal swelling. Point tenderness.
- Grade II (Moderate sprain): Mild to moderate instability, complete or partial tearing of ligament. Localized swelling limp with walking.
- Grade III (Severe sprain): Significant instability, complete tear of capsule and ligament. Diffuse swelling, unable to bear weight fully.⁴

MAITLAND MOBILIZATION

Joint mobilization refers to manual therapy technique that is used to modulate pain and treat joint dysfunction that limits range of motion. Mobilization is a passive skilled manual therapy technique applied to the joint.

Grades of mobilization have been described by Maitland depending on the aim of treatment

- Grade 1- small amplitude rhythmic oscillation is performed at the beginning of range.
- Grade 2- large amplitude rhythmic oscillations are performed within the range, not reaching the tissue limit.
- Grade 3- Large amplitude rhythmic oscillations are performed up to the limit of the available motion and are stressed into the tissue limit.
- Grade 4- Small amplitude rhythmic oscillations are performed at the limit of the available motion and stressed into the tissue resistance.
- Grade 5- Small amplitude, high velocity thrust technique is performed to snap adhesion at the limit of the available motion.⁵

MOBILIZATION WITH MOVEMENT

- MWM is the concurrent application of a pain free accessory mobilization with active and/or passive physiological movement. Passive end of range overpressure or stretching is then applied without pain as a barrier.⁵
- Brian Mulligan originally described this technique.

ACTIVE RANGE OF MOTION EXERCISE

- Active ROM (AROM) is movement of a segment within the unrestricted ROM that is produced by active contraction of the muscles crossing that joint.
- To maintain normal ROM, the segments must be moved through their available ranges periodically, whether it is the available joint range or muscle range.
- Therapeutically, ROM activities are administered to maintain joint and soft tissue mobility to minimize loss of tissue flexibility and contracture formation.⁵

CRYOTHERAPY

- The use of cryotherapy, i.e. the application of cold for the treatment of injury or disease, is widespread in sports medicine today. It is an established method when treating acute soft tissue injuries
- Various methods such as ice packs, ice towels, ice massage, gel packs, refrigerant gases and inflatable splints can be used.
- The physiological and biological effects are due to the reduction in temperature in the various tissues, together with the neuromuscular action and relaxation of the muscles produced by the application of cold. The application of cold has also been found to decrease the inflammatory reaction.⁶
- The primary contribution of this study is the comparative evaluation of Maitland Mobilization and Mobilization with Movement (MWM) in basketball players with lateral ankle sprain. This study investigates the effectiveness of both interventions in reducing pain and improving ankle dorsiflexion range of motion (ROM). By directly comparing these commonly used manual therapy techniques in a sports-specific population, the findings provide evidence-based guidance for physiotherapists in selecting appropriate rehabilitation strategies. The results demonstrated that both interventions were effective in reducing pain and improving dorsiflexion ROM; however, no statistically significant differences were observed between the two treatment approaches.

NEED FOR STUDY

- Lateral ankle sprain is one of the most common musculoskeletal injuries in basketball players due to frequent jumping, landing, cutting, and rapid directional changes. Recurrent ankle sprains often lead to persistent pain, reduced dorsiflexion range of motion (ROM), impaired balance, and decreased athletic performance.¹
- Manual therapy techniques such as Maitland Mobilization and Mobilization with Movement (MWM), proposed by Geoffrey Maitland and Brian Mulligan respectively, are widely used in physiotherapy practice to reduce pain and improve joint mobility. Both techniques aim to restore accessory joint movements, enhance functional range, and promote early return to sports participation.
- Although several studies have demonstrated the effectiveness of Maitland mobilization and MWM individually in managing ankle sprains, there is limited comparative evidence specifically in basketball players, who are at a higher risk due to sport-specific demands. Furthermore, it remains

unclear whether one technique is superior in improving dorsiflexion ROM and reducing pain in this athletic population.

- Hence, our study is an effort to highlight the comparison of effect of Maitland mobilization and MWM on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprain.

AIMS

- To compare the effects of Maitland mobilization and MWM on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprain.

OBJECTIVE

- To study the effectiveness of Maitland mobilization on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprain at the end of 2 weeks using NPRS scale and goniometry.
- To study the effectiveness of MWM on pain and limited dorsiflexion range of motion in basketball player with lateral ankle sprain at the end of 2 weeks using NPRS scale and goniometry.
- To compare the effectiveness of Maitland mobilization and MWM on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprain at the end of 2 weeks using NPRS scale and goniometry.

REVIEW OF LITERATURE

1. The efficacy of manual joint mobilisation/manipulation in treatment of lateral ankle sprains: a systematic review

A systematic review by Loudon et al. (2013) examined the efficacy of manual joint mobilization/manipulation in the treatment of lateral ankle sprains. After screening 70 studies, eight met the inclusion criteria, focusing on both acute and subacute/chronic ankle sprains. The findings showed that for acute ankle sprains, manual joint mobilization significantly reduced pain and improved dorsiflexion range of motion. For subacute and chronic cases, these techniques improved joint mobility, decreased pain, and enhanced overall function. Most studies assessed only immediate effects, with no reported adverse outcomes, supporting manual therapy as an effective short-term intervention for lateral ankle sprains.

2. The Effectiveness of Mobilization With Movement at Improving Dorsiflexion After Ankle Sprain" by Matthew C. Hoch and Patrick O. McKeon (2010)

Ankle sprains are among the most frequent orthopaedic injuries in physically active individuals, with a high risk of recurrence leading to chronic ankle instability and reduced functional capacity. Literature indicates that a common deficit following ankle sprain is decreased dorsiflexion range of motion, which can contribute to altered joint mechanics, proprioceptive deficits, and long-term functional limitations. Joint mobilization, particularly Mobilization with Movement (MWM), has been investigated as a technique to improve accessory and physiological motion at the talocrural joint. MWM involves simultaneous active or passive movement with accessory glide and is theorized to restore normal joint motion and alignment. The authors searched for high-quality evidence (level 2 or higher) supporting MWM's effectiveness and found 3 studies meeting inclusion criteria, all supporting improvements in dorsiflexion in individuals with a history of ankle sprain. This suggests that MWM may be a clinically useful intervention during rehabilitation for improving ankle dorsiflexion after sprains.

3. Efficacy of Mobilization with Movement for Patients with Limited Dorsiflexion after Ankle Sprain: A Crossover Trial

Limited dorsiflexion is a common consequence following ankle sprains and is associated with altered gait patterns, decreased functional performance, and increased risk of re-injury. Previous studies have highlighted that chronic ankle instability may stem from mechanical restrictions and proprioceptive deficits post-injury. Mobilization with Movement (MWM), a manual therapy technique introduced by Brian Mulligan, has been shown to improve range of motion and reduce pain by combining passive joint mobilization with active movement. Earlier research supports the use of MWM in improving talocrural joint dorsiflexion, particularly in individuals with persistent post-sprain mobility deficits. Several clinical trials and systematic reviews have reported significant short-term gains in dorsiflexion range and functional tasks like squatting and walking. These findings form the basis for investigating the immediate and short-term effects of MWM through controlled trials, such as the present crossover design, to evaluate its efficacy more rigorously.

4. 10-Year Epidemiology of Ankle Injuries in Men's and Women's Collegiate Basketball.

Ankle sprain is one of the most common musculoskeletal injuries among athletes, particularly in basketball players due to repetitive jumping, landing, cutting, and rapid changes in direction. Epidemiological evidence strongly supports the high prevalence of ankle injuries in this population. A 10-year study by Sailesh V. Tummala et al. Titled 10-Year Epidemiology of Ankle Injuries in Men's and Women's Collegiate Basketball reported that ankle injuries are the most frequent injuries in collegiate basketball players. The study revealed injury rates of 1.49 per 1000 athlete-exposures in men and 1.21 per 1000 athlete-exposures in women. The majority of injuries involved the lateral ligament complex (80–83%), occurred during preseason and competition, and were managed conservatively. Most athletes returned to play within seven days. These findings highlight the clinical importance of effective rehabilitation strategies for lateral ankle sprain in basketball players.

HYPOTHESIS

NULL HYPOTHESIS: -

- No significance between Maitland mobilization and MWM on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprain.

ALTERNATE HYPOTHESIS: -

- H1-Effectiveness of Maitland mobilization is more than MWM on pain and limited dorsiflexion range of motion in basketball player with lateral ankle sprains.
- H2-Effectiveness of MWM more than Maitland mobilization on pain and limited dorsiflexion range of motion in basketball players with lateral ankle sprains

METHODOLOGY

- Study design - Comparative study
- Sample size- 50
- Sampling method- Purposive sampling.
- Study population- Basketball players diagnosed with acute and subacute lateral ankle sprain.
- Study setting- Various hospitals and OPD
- Study duration - 6 months.
- Treatment duration - 2 weeks.

Sample size was calculated using the formula for comparison of two independent groups:

$$N = 2(Z_{\alpha/2} + Z_{\beta})^2 / d^2$$

Where $Z_{\alpha/2} = 1.96$ for a 5% level of significance, $Z_{\beta} = 0.84$ for 80% power, and $d = 0.56$ (moderate effect size based on previous manual therapy studies). Substituting these values into the formula yielded a minimum sample size of approximately 25 participants per group. Therefore, a total sample size of 50 participants (25

in each group) was considered adequate to detect a statistically significant difference between the intervention groups.

CRITERIA

INCLUSION CRITERIA:

1. Basketball players aged between 18–25 years.¹
2. Both male and female basketball players.¹
3. Diagnosed acute and sub acute Grade I and Grade II lateral ankle sprain in basketball players.
4. Basketball players who are actively participating in competitive or recreational basketball.¹
5. Basketball players with limited ankle dorsiflexion range of motion on the affected limb compared to the unaffected side.
6. Basketball players with unilateral ankle involvement.
7. Basketball players with NPRS score less than 7

EXCLUSION CRITERIA:

1. History of previous ankle sprain with giving way.
2. Associated bony injuries (avulsion fracture)
3. Patient with skin problems like infection
4. Any ankle and foot deformity
5. Diagnosed OA of ankle
6. Basketball players who are actively involved in playing or training activities at the time of assessment.

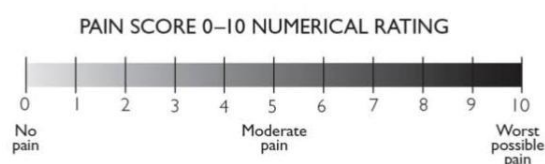
MATERIAL USED

- Pen
- Paper
- Goniometer
- NPRS Scale
- Data collection sheet
- Non elastic mulligan belt.

OUTCOME MEASURES

1. NUMERICAL PAIN RATING SCALE: -

- a. Pain intensity is frequently measured on an 11-point pain intensity numerical rating scale (PI-NRS), where 0 = no pain and 10 = worst possible pain.
- b. Reliability: - 0.86-0.95 Validity: - 0.79-0.96
0-10 Numeric Pain Rating



2. GONIOMETRY: -

- a. Goniometry refers to the measurement of angle, in particular the measurement of bones of the body. Goniometry may be used to determine both a particular joint position and the total amount of motion available at a joint.
- b. Reliability and validity: - The ICC for measurement of active dorsiflexion - 0.92

PROCEDURE FOR ANKLE DORSIFLEXION:

- Testing position- Place the subject sitting, with the knee flexed to 90 degrees position. The foot in 0 degrees of inversion and eversion.

Goniometer Alignment-

- Center the fulcrum of the Goniometer over the lateral aspect of the malleolus. Align the proximal arm with the lateral midline of the fibula, using the head of the fibula for reference. Align the distal arm parallel to the lateral aspect of the fifth metatarsal.
- In starting position for measuring dorsiflexion range of motion the ankle is positioned so that the goniometer is at 90 degrees. This goniometer reading is transposed and recorded as 0 degrees. The examiner sits on a stool or kneels in order to align the goniometer and perform the reading at eye level. At the end examiner uses one hand to align the proximal goniometer arm while the other hand maintains dorsiflexion and alignment of the distal goniometer arm.⁷

PROCEDURE

- Study was started with the presentation of synopsis to an ethical committee. The topic was thoroughly inspected from all the facets and then ethical clearance will be grant by the committee.
- The subjects were selected on the basis of inclusion and exclusion criteria.
- The subjects were explained about the study before starting the procedure. Consent was taken from the patients who were wish to participate in the study.
- The 50 subjects were selected randomly after assessment is done and selection will be based on the inclusion criteria.
- These 50 subjects were divided into 2 groups. Each group includes 25 samples.
- Pain was assessed using NPRS scale and dorsiflexion range of motion was assessed using goniometry and values were recorded.
- One group received the protocol with maitland mobilization and other received the protocol with MWM.
- NPRS scale and goniometry was done to assess pain and dorsiflexion ROM after Adminstrating the protocol and values were recorded.
- Data was analysed.

GROUP A	GROUP B
Maitland mobilization for ankle joint to increase dorsiflexion range of motion (Grade II, 3 repetition per session, every alternate day for 2 weeks)	MWM for ankle joint to increase dorsiflexion range of motion (3 sets per session, every alternate day for 2 weeks)
Active range of motion exercises (Ankle dorsiflexion, plantarflexion, inversion, eversion)	Active range of motion exercises (Ankle dorsiflexion, plantarflexion, inversion, eversion)
Cryotherapy 10-15 minutes, thrice a day	Cryotherapy 10-15 minutes, thrice a day

PROTOCOL

GROUP A

1 Maitland mobilization was given every second day.

- Patient Position: Supine, with the leg supported on the table and the heel over the edge.
- Therapist Position and Hand Placement: Stand to the side of the patient. Stabilize the leg with your cranial hand.
- Place the palmar aspect of the web space of your other hand over the talus just distal to the mortise.
- Wrap your fingers and thumb around the foot to maintain the ankle in resting position. Grade I distraction force is applied in a caudal direction.
- Mobilizing Force: Glide the talus posteriorly with respect to the tibia by pushing against the talus.⁵
- Mobilization was given for 2 weeks

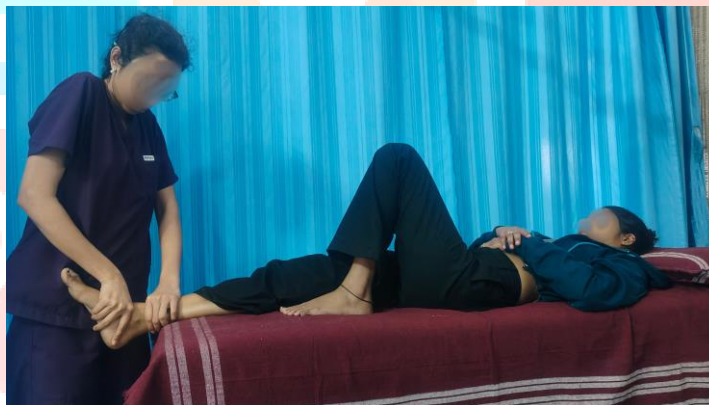
3 sets of 10 repetitions were given with 1 min between sets.

2. Active Range of Motion exercises

- Dorsiflexion, plantarflexion, inversion and eversion

3. Cryotherapy

- Ice pack is recommended for 10-15 minutes, thrice a day



GROUP B

1. Mobilization with movement

- Patient is standing or kneeling with one foot forward on a treatment table.
- Treatment belt is looped around the patient's distal lower leg, at right angle to lower leg and around the therapist's hips.
- Therapist fixates the talus with the web-space of both hands so as to prevent movement of the talus anteriorly.
- Therapist glides the tibia anteriorly with the treatment belt.
- Patient lunges forward to gain dorsiflexion range.⁸

Three sets of 10 repetitions were applied with 1 min between sets.

Mobilization with movement was given for 2 weeks.

2. Active Range of motion exercise

Dorsiflexion, plantarflexion, inversion and eversion.

3. Cryotherapy

Ice pack is recommended for 10-15 minutes, thrice a day

This was done for 2 weeks. Outcome was measured after 2 weeks.



DATA AND STATISTICAL ANALYSIS

Paired t test was performed to analysis of pre– post difference within the group and p value, mean and mean of difference was calculated. Result from the statistical analysis tabulated and presented in a graphical format for better understanding and easier interpretation.

Unpaired t test was performed to analysis of post- post difference between the 2 groups and p value and mean was calculated. Result from statistical analysis tabulated and presented in a graphical format for better understanding and easier interpretation.

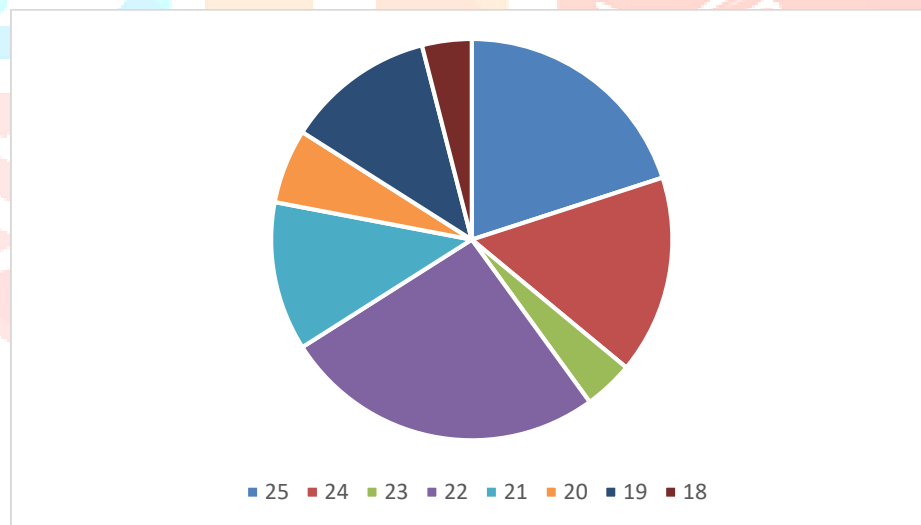


Figure No.1 shows the age-wise distribution of participants between 18 and 25 years.

A total of 30 participants were included in the study. Among them, 30 (60%) were females and 20 (40%) were males, indicating a female predominance in the sample.

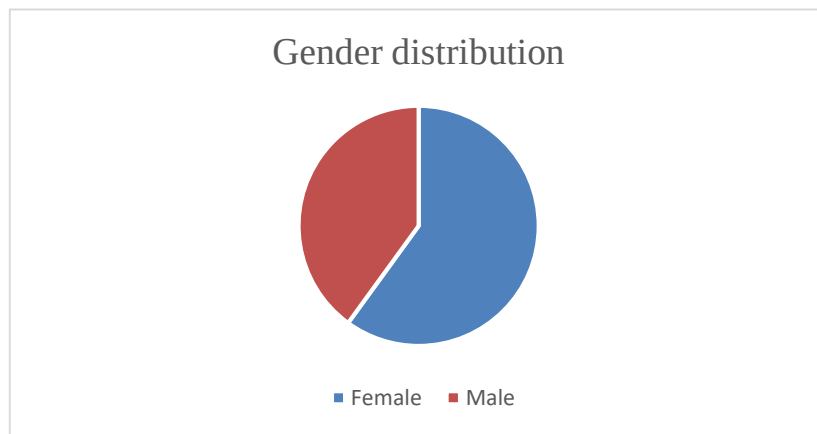


Figure No.2 shows the age-wise distribution of participants

INTRA GROUP COMPARISON

Table No.1 showing pre and post NPRS score value in group A and group B

	Pre treatment Mean±SD	Post treatment Mean±SD	t value	p- value	Result
NPRS					
Group A	4.76±1.10	1.44±1.12	17.47	P<0.0001	Significant
Group B	4.76±1.21	1.68±0.98	16.38	P<0.0001	Significant

The comparison of NPRS score of pre and post treatment was analyzed. There 'p' value obtained was ($p<0.001$). e. significant in group A with pretreatment value as (4.76 ± 1.10) and post treatment value of (1.44 ± 1.12). The group B value before treatment was (4.76 ± 1.21) and post treatment value as (1.68 ± 0.98). The 'p' value was ($p<0.0001$) i.e. significant for group B

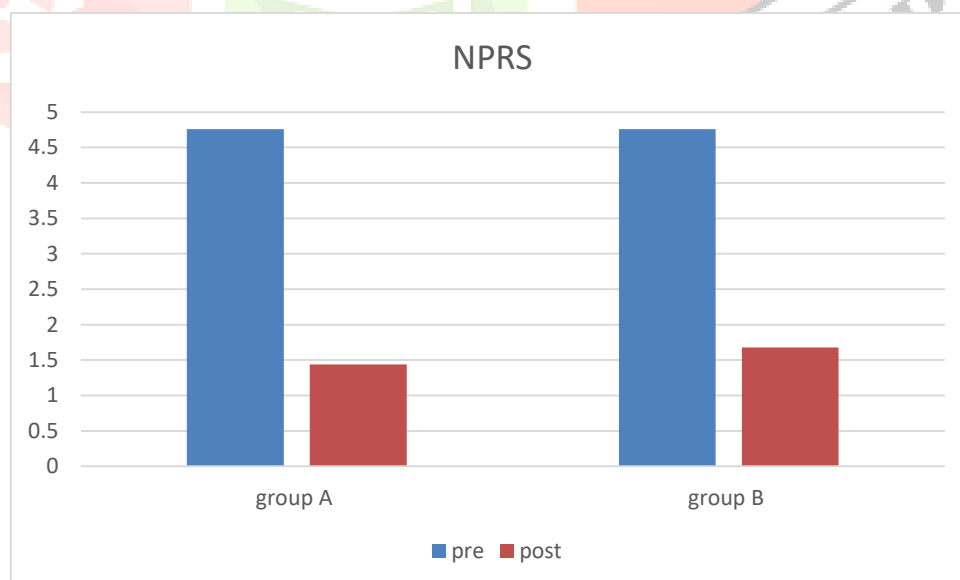
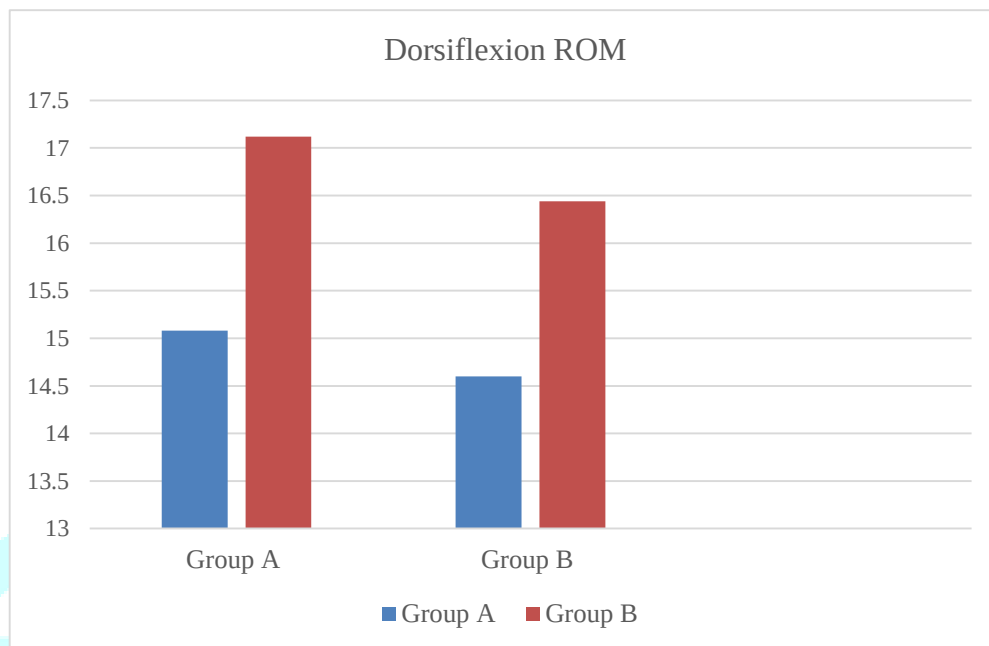


Table No.2 showing pre and post Dorsiflexion ROM score value in group A and group B

Dorsiflexion ROM	Pre treatment Mean±SD	Post treatment Mean±SD	t value	p- value	Result
Group A	15.08±2.49	17.12±1.38	4.90	P<0.001	Significant
Group B	14.60±2.63	16.84±1.55	5.33	P<0.001	Significant

The comparison of dorsiflexion ROM of pre and post treatment was analyzed. There 'p' value obtained was ($p<0.001$) i.e. significant in group A with pretreatment value as (15.08 ± 2.49) and post treatment value of

(17.12±1.38). The group B value before treatment was (14.60±2.63) and post treatment value as (16.84±1.55). The 'p' value was ($p < 0.001$) i.e. significant for group B.



INTER GROUP COMPARISON

Table No.3 showing comparison of NPRS value in group A and group B

Group A Mean±SD	Group B Mean±SD	t value	p- value	Result
1.44±1.12	1.68±0.98	0.81	$p > 0.05$	Not significant

The comparison of NPRS score values of group A and group B was analyzed. Mean of group A was (1.44±1.12) while that of group B was (1.68±0.98). The 't' value obtained was 0.81 and 'p' value > 0.05 indicating the value was not significant for group B.

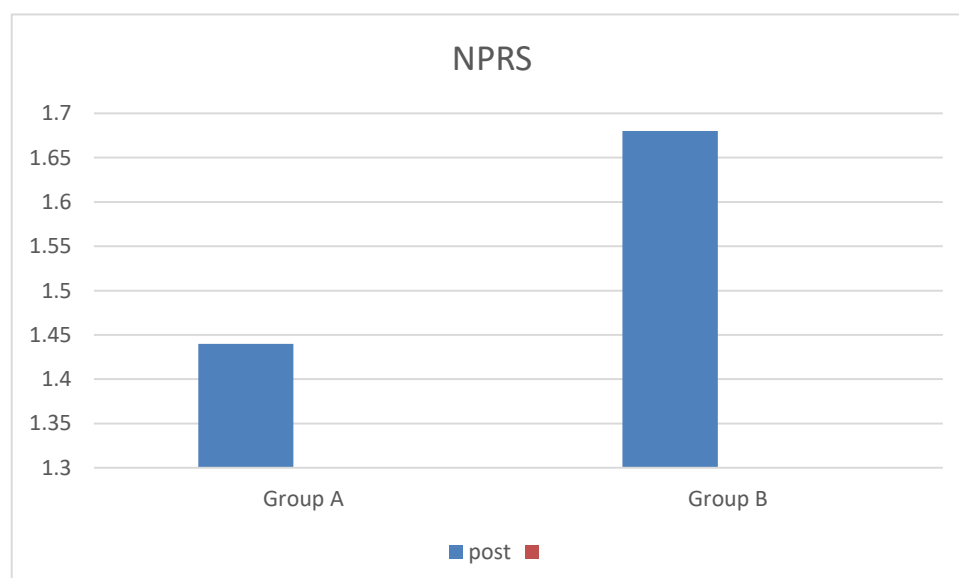
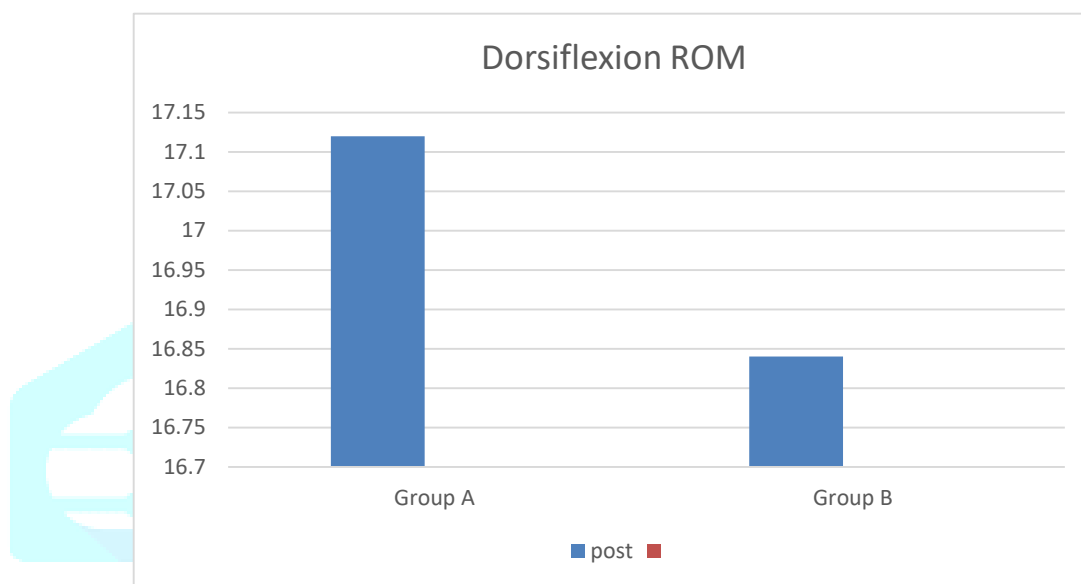


Table No.4 comparison of Dorsiflexion ROM in group A and group B

Group A Mean±SD	Group B Mean±SD	t value	p- value	Result
17.12±1.38	16.84±1.55	0.68	p > 0.05	Not significant

The comparison of dorsiflexion ROM of group A and group B was analyzed. Mean of group A was 17.12±1.38 while that of group B was (16.3±1.40). The 't' value obtained was 1.72 and 'p' value>0.05 indicating the value was not significant for group B.



RESULT

- Paired t test was used to compare the value of NPRS score and dorsiflexion ROM before and after treatment in group A and group B. Unpaired t test was used to compare the value of NPRS score and dorsiflexion ROM between group A and group B
- The comparison of NPRS score of pre and post treatment was analyzed. There 'p' value obtained was (p<0.001). i.e. significant in group A with pretreatment value as (4.76±1.10) and post treatment value of (1.44±1.12). The group B value before treatment was (4.76±1.21) and post treatment value as (1.68±0.98). The 'p' value was (p<0.0001) i.e. highly significant for group B
- The comparison of dorsiflexion ROM of pre and post treatment was analyzed. There 'p' value obtained was (p<0.001) i.e. significant in group A with pre treatment value as (15.08±2.49) and post treatment value of (17.12±1.38). The group B value before treatment was (14.60±2.63) and post treatment value as (16.84±1.55). The 'p' value was (p<0.001) i.e. highly significant for group B.
- The comparison of NPRS score values of group A and group B was analyzed. Mean of group A was (1.44±1.12) while that of group B was (1.68±0.98). The 't' value obtained was 0.81 and 'p' value >0.05 indicating the value was not significant for group B.
- The comparison of dorsiflexion ROM of group A and group B was analyzed. Mean of group A was (17.12±1.38) while that of group B was (16.84±1.55). The 't' value obtained was 0.68 and 'p' value>0.05 indicating the value was not significant for group B.

DISCUSSION

- The present study was conducted to compare the effectiveness of Maitland mobilization and Mobilization with Movement (MWM) in improving pain, ankle dorsiflexion range of motion in basketball players with lateral ankle sprains.
- The results demonstrated that both interventions were effective in reducing pain and improving ankle dorsiflexion ROM. However, no statistically significant difference was observed between the two groups, indicating that both treatment approaches are similarly effective in the management of lateral ankle sprain.
- The improvement in pain may be attributed to the neurophysiological effects of joint mobilization, which stimulate mechanoreceptors and inhibit nociceptive input at the spinal cord level. By restoring accessory motion at the talocrural joint, these techniques reduce abnormal stress on ligaments and surrounding soft tissues.
- Maitland mobilization primarily improves joint accessory motion (anterior-posterior glide of the talus), which can restore normal arthrokinematics, restoration of accessory joint movement may have contributed to improved dorsiflexion range. MWM, on the other hand, combines passive mobilization with active movement, facilitating both joint motion and functional neuromuscular control.
- The findings of the present study demonstrated that both Maitland Mobilization and Mobilization with Movement (MWM) were effective in reducing pain and improving ankle dorsiflexion range of motion in basketball players with lateral ankle sprain. These findings are in agreement with the systematic review by Loudon et al. (2014), which reported that manual joint mobilization and manipulation are effective treatment approaches for lateral ankle sprains. Similarly, Hoch (2010) reported that Mobilization with Movement is effective in improving ankle dorsiflexion following ankle sprain.
- The findings of the present study are partially consistent with those reported by Norouzi et al. (2021), who compared Maitland mobilization and Mobilization with Movement (MWM) in individuals with lateral ankle sprain. They observed that both techniques significantly improved pain and ankle range of motion, with MWM demonstrating greater effectiveness. In contrast, the present study found significant improvements in pain and dorsiflexion range of motion following both interventions, with no statistically significant difference between the groups. The discrepancy between the findings may be attributed to differences in sample characteristics, intervention duration, and outcome assessment methods. Nevertheless, both studies support the beneficial role of manual therapy in the rehabilitation of lateral ankle sprain.
- The findings present study are consistent with previous studies supporting the effectiveness of manual joint mobilization in the management of lateral ankle sprain. Green et al. (2001) reported that passive accessory joint mobilization improved pain-free dorsiflexion in individuals with acute ankle inversion sprains, while Ishanka Weerasekara et al. (2014), in a systematic review and meta analysis, concluded that Joint mobilization appears to be beneficial for improving dynamic balance immediately after application, and dorsiflexion range for ankle sprains. Similarly, studies by Hoch (2010) demonstrated that Mobilization with Movement effectively improves ankle dorsiflexion range of motion and functional outcomes. Therefore, the findings of the present study are in agreement with the existing literature, suggesting that both manual joint mobilization and MWM are beneficial interventions for restoring ankle dorsiflexion following lateral ankle sprain.
- The absence of a significant difference between the groups in the present study indicates that both techniques may be equally effective, and the choice of intervention may depend on clinical preference and patient-specific factors.

CONCLUSION

- The present study successfully addressed its aim of comparing the effectiveness of Maitland Mobilization and Mobilization with Movement in basketball players with lateral ankle sprain. The findings demonstrated that both interventions were effective in reducing pain and improving ankle dorsiflexion range of motion, with no statistically significant difference observed between the two groups. Therefore, both techniques may be considered effective treatment options for the rehabilitation of lateral ankle sprain.
- Significant improvements were observed in both groups following treatment, indicating that manual therapy plays an important role in the rehabilitation of ankle injuries.
- Hence our null hypothesis is accepted.

LIMITATIONS

- No long-term follow-up was conducted to determine the sustainability of treatment effects.
- The study included participants from a limited age group, which may restrict the applicability of the results to other populations.
- The intervention duration of two weeks is a limitation of this study, as it does not allow assessment of the long-term effects of the interventions.

FUTURE SCOPE

- Long-term follow-up studies are required to determine the sustained effect of both the interventions and their role in preventing recurrence of ankle sprains.
- Further research may also compare these techniques in different stages of injury (acute, subacute, and chronic) to determine stage-specific effectiveness. Including additional outcome measures such as functional performance tests, dynamic balance proprioception, and return-to-sport timelines would provide a more comprehensive understanding of clinical benefits.
- Future studies should include a larger sample size to improve the generalizability of the findings.

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Master Chart

Sample no	Age	Pre value		Post value		Treatment given
		NPRS	ROM	NPRS	ROM	
1	24F	6/10	12°	2/10	18°	Maitland mobilization
2	22/F	4/10	14°	0/10	17°	MWM
3	22/F	6/10	10°	3/10	17°	Maitland mobilization
4	25/M	5/10	15°	2/10	18°	MWM
5	23/F	3/10	14°	0/10	18°	Maitland mobilization
6	22/M	5/10	18°	1/10	18°	MWM
7	25/F	6/10	18°	3/10	20°	Maitland mobilization
8	21/M	4/10	10°	2/10	15°	MWM
9	21/M	6/10	17°	0/10	18°	Maitland mobilization
10	24/F	5/10	15°	1/10	15°	MWM
11	19/F	6/10	15°	2/10	18°	Maitland mobilization
12	20M	4/10	13°	2/10	15°	MWM
13	25/F	4/10	18°	0/10	18°	Maitland mobilization
14	24/F	3/10	14°	1/10	17°	MWM
15	22/F	6/10	15°	3/10	16°	Maitland mobilization
16	18/M	6/10	17°	2/10	18°	MWM
17	22/F	4/10	12°	3/10	16°	Maitland mobilization
18	25/F	5/10	18°	2/10	18°	MWM
19	22/M	4/10	15°	0/10	17°	Maitland mobilization
20	19/F	2/10	14°	1/10	15°	MWM
21	25/F	5/10	18	2/10	18°	Maitland mobilization
22	24/M	6/10	15°	4/10	17°	MWM
23	25/F	3/10	15°	0/10	15°	Maitland mobilization
24	21/F	6/10	12°	3/10	14°	MWM
25	24/M	5/10	14°	2/10	16°	Maitland mobilization
26	19/F	3/10	15°	1/10	15°	MWM
27	22M	4/10	18°	2/10	18°	Maitland mobilization
28	25/M	6/10	15°	3/10	17°	MWM
29	19/M	4/10	12°	1/10	15°	Maitland mobilization
30	22/F	6/10	13°	2/10	16°	MWM
31	23/F	3/10	14°	0/10	18°	Maitland mobilization

32	22/M	5/10	18°	1/10	18°	MWM
33	20/F	6/10	18°	3/10	20°	Maitland mobilization
34	21/M	4/10	10°	2/10	15°	MWM
35	21/M	6/10	17°	0/10	18°	Maitland mobilization
36	24/F	5/10	14°	1/10	15°	MWM
37	19/F	6/10	18°	2/10	18°	Maitland mobilization
38	20M	4/10	18°	2/10	15°	MWM
39	25/F	4/10	10°	0/10	18°	Maitland mobilization
40	24/F	3/10	17°	1/10	17°	MWM
41	22/F	6/10	15°	3/10	16°	Maitland mobilization
42	24F	6/10	14°	2/10	18°	MWM
43	22/F	4/10	15°	0/10	17°	Maitland mobilization
44	22/F	6/10	17°	3/10	17°	MWM
45	25/M	5/10	14°	2/10	18°	Maitland mobilization
46	18/F	3/10	18°	0/10	18°	MWM
47	22/M	5/10	18°	1/10	18°	Maitland mobilization
48	25/F	6/10	10°	3/10	20°	MWM
49	19/M	4/10	17°	2/10	15°	Maitland mobilization
50	21/M	6/10	15°	0/10	18°	MWM

