



## EFFECTIVENESS OF MAITLAND MOBILIZATION VERSUS MULLIGAN MOBILIZATION FOR FLATFOOT IN THE MIDTARSAL JOINT

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### ABSTRACT

**BACKGROUND:** Flatfoot produces a relative flattening of the plantar surface. Pain in medial longitudinal arch and the ankle are frequent. GD Maitland introduces the concept of passive oscillatory mobilization for physiology and additional movements. Mulligan procedures were created to address joint 'tracking' issues or 'positional defects,' i.e. joints with modest biomechanical alterations. **AIM:** To compare the effects of Maitland mobilization and MWM in Midtarsal joint on pain and discomfort in participants with Flatfoot, **STUDY DESIGN:** Comparative Study **METHOD:** The committee approved ethical clearance for comparative study. Samples were collected using a random number generator. Through inclusion and exclusion criteria, 30 participants were selected. Following an explanation of the treatment's details, participants' written consent was obtained. Group A received Maitland Mobilization, while Group B received MWM for 4 days/week. **OUTCOME MEASURE:** NPRS, FADI, Goniometer (Smart Protractor App) **RESULTS:** The data was analyzed using SPSS Version 22. The group A receiving conventional therapy with Maitland's mobilization score of NPRS (pre=6.067±0.703, post=3±0.926), FADI (pre= 53.8±1.373, post= 74±1.558), and ROM (DF, pre=48.9±8.9, post=15.867±1.06) was not a statistically significant advantage to group B receiving conventional therapy with MWM score of NPRS (pre=5.4±1.404, post=1.933±0.798), FADI (pre=54.6±2.197, post=76±1) and ROM ( DF, pre=13±1.927, post=17±1.603). **CONCLUSIONS:** MWM along with conventional exercise was effective to reduce pain, ROM and improve ADLs in Flatfoot.

Keywords : Flatfoot, Maitland Mobilization, MWM, NPRS, FADI

### Introduction

Flatfoot is a long term condition which is developing over time due to inflammation or other musculoskeletal disorders [1]. This condition is characterized by a collapsing medial arch, forefoot abduction, talus medial rotation and plantar flexion, eversion of the calcaneus [2,3]. In flat foot Medial Longitudinal Arch (MLA) is higher than lateral arch also the longitudinal arch's curvature is flattened to various levels while bearing weight [4-7].

According to Otsuka R et al. Flatfoot was prevalent in 26.5% of men and 25.7% of women, affected participants had a higher prevalence of leg pain and fatigue than unaffected participants in both genders [8]. Due to ligamentous changes in Flatfoot, the inner sides of the foot ligaments are stretched. Muscular

changes are the source of the Achilles tendon shortening and lateral deviation, as well as the peronei muscle spasm. It is possible for the intrinsic muscles to stretch, particularly the interosseous muscles of the foot [9].

Flatfoot can be found in people of all ages and genders. The discomfort is often progressive, although it can become acute after trauma. Additionally, it has an impact on actions like running, walking and standing [9]. The medial longitudinal arch and ankle are common sites of pain. In children and adolescents pain secondary to flatfoot may be described as pain in the arch of the foot or cramps at night[10]. Adults may complain of pain in their midfoot, heel, lower leg, knee, hip or back from strained muscles and connective tissues [11].

Conventional treatment includes strengthening exercises like repeated toe flexion without shoes, walking and standing on the outer edge of the foot, toe and heel raise performed ten times each[12,13]. Activities to improve the dynamic arch include raising up on your tiptoes, walking on the heels, and going barefoot in soft sand [14].

Stretching of the gastrocnemius soleus complex and peroneus brevis muscles to encourage varus and foot adduction are two exercises that improve flexibility. Achilles tendon and calf muscle stretches for the heel cord might help relieve tightness [15].

To prevent valgus and flattening of the anterior arch, strengthening exercises are performed on both the anterior and posterior tibialis muscles, as well as the flexor hallucislongus, Intrinsic, interosseus palmaris, and the abductor hallucis[16]. Theraband exercises for strengthening the arch muscles, bear-footed walking with advice for shoes modification [17, 18].

The concept of Mulligan Mobilization has proved to regain functional movement with the application of pain-free accessory glides either through active or passive physiological movements [19]. According to Alkady et al. Mulligan Mobilization is a powerful manual technique for enhancing joint range of motion and minimizing pain [20]. It requires the physical application of a sustained glide to a joint by a therapist while the patient actively moves the joint at the same time [21].

Geoffrey Douglas Maitland establishes the concept of assessment and treatment by passive oscillatory mobilization for physiology and accessory movements [9].

The Foot and Ankle Disability Index (FADI) was created to evaluate functional limits caused by disorders affecting the foot and ankle [22]. ADL Difficulty and Severity of pain Measurement are the two components of FADI. FADI with higher score indicating lower disability [23].

The Numerical Pain rating Scale (NPRS) is proven rational and reliable to measure pain intensity. The participants are asked to be give the numeric value on the segmented scale which best describes their pain intensity[24]. The Numerical Pain rating Scale is an eleven-point measure of pain in which participants rate their pain ranging from 0 (no pain) to 10 (worst imaginable pain)[25].

Previous studies have compared the effects of mobilization and mobilization with movement on the range of motion and pain in other joints (Gautam et al., 2014; Haider et al., 2014), and it seems that both these techniques of treatment improve the range of motion and pain. To the researchers' knowledge, no study has yet been conducted to compare the effects of these two techniques to determine the best treatment for Flatfoot.

Need of study: Prior studies have not revealed whether Maitland Mobilization or Mulligan Mobilization is more helpful at reducing pain and enhancing Midtarsal joint mobility in individuals with flatfoot. Participants in earlier research with osteoarthritis of the knee, frozen shoulder, and other conditions were involved.

The need and significance of the study is to determine which technique is more effective for populations of flatfoot.

### **AIM AND OBJECTIVES:**

**AIM:** To compare the effects of Maitland and Mulligan Mobilization in Midtarsal joint on pain and discomfort in participants with Flat-foot and determine which is superior for achieving the best outcome and benefit to the population.

### **OBJECTIVES:**

To find the effectiveness of Maitland Mobilization Vs Mulligan Mobilization for reducing pain in Flat foot participants.

To find the effectiveness of Maitland Mobilization Vs Mulligan Mobilization for increasing range of motion in Flat foot participants.

### **HYPOTHESES**

#### **Null Hypothesis [H0]**

H<sub>0</sub>1 - There will be no significant differences in the effect of Maitland Mobilization and Mulligan Mobilization for reducing pain in Flat foot participants.

H<sub>0</sub>2 - There will be no significant difference in the effect of Maitland Mobilization and Mulligan Mobilization for increasing range of motion in Flat foot participants.

#### **Alternative Hypothesis [H1]**

H<sub>1</sub>1 - There will be a significant difference in the effect of Maitland Mobilization and Mulligan Mobilization for reducing pain in Flat foot participants.

H<sub>1</sub>2 - There will be a significant difference in the effect of Maitland Mobilization and Mulligan Mobilization for increasing range of motion in Flat foot participants.

### **REVIEW OF LITERATURE**

Charleen D'Silva et al (2017) Conducted RCT on "Comparative Effect of Mobilization, Low Dye Taping and Faradic Foot Bath in Subjects with Flat Foot – A Randomized Clinical Trial". This research found that the Navicular drop height and the arch index in persons with flat foot could be decreased by talonavicular mobilization, low dye taping, and faradic foot bath equally well.

Bill Vicenzino et al (2006) "Initial Changes in Posterior Talar Glide and Dorsiflexion of the Ankle After Mobilization With Movement in Individuals With Recurrent Ankle Sprain" This pilot study showed that MWM treatment methods initially improved dorsiflexion range of motion and posterior talar glide in

patients with recurrent lateral ankle sprain. This study found that this strategy should be taken into account in lateral ankle sprain rehabilitation protocols.

## MATERIALS AND METHODOLOGY

**Type of Research** -Interventional Study

**Study Design**-Comparative study

**Sample Design** - Simple Random Sampling (Random Number Generator)

**Study Population** - Participants with Flatfoot

**Sample Size** - 30 Participants [Group A – 15 Participants, Group B – 15 Participants]

**Study Setting** - OPD-3 CBR Department, Nootan College of Physiotherapy,  
Sankalchand Patel University, Visnagar, Gujarat.

**Study Duration** - 6 Months

**Treatment Duration** - 6 Weeks

### Inclusion Criteria:

- Age : 18 - 30 years
- Both male and female
- Unilateral or bilateral flatfoot
- Participants with mild to moderate Pain intensity on NPRS scale
- Obesity
- Participants who are willing to be part of this study.

### Exclusion Criteria:

- Neurological deficit
- Recent Injuries, Surgery & Fracture in lower limb
- Skin Infection
- Rheumatoid Arthritis
- Diabetes
- Pregnancy

### Materials Required:

- Assessment Form & Consent Form
- Functional Outcome Form
- Ball & Chair
- Pen & Paper
- Laptop
- Plinth & Pillow
- Goniometer (Smart Protractor App)

### Outcome Measures:

- Intensity of pain -NPRS (Numerical Pain Rating Scale)
- FADI Score
- Goniometer (Smart protractor app)

### Sampling Procedure:

This research proposal was accepted by the institutional ethical committee of Nootan College of Physiotherapy, Sankalchand Patel University, Visnagar (Ref No.: NCP/Certi/338/2022). Participants were selected on the basis of Inclusion & Exclusion Criteria and were allocated by simple random sampling into group A and B respectively. The whole procedure was clearly explained to all the participants and their consent was taken.

Data Collection Procedure:

The study population comprised 30 participants with Flatfoot. The participants were randomly distributed into 2 groups – A (n-15) & B (n-15). The physical assessment of all participants was recorded at the outset of the study. FADI and NPRS scales were taken for all participants before and after the treatment. The participants of an experimental group completed classic PT for 6 weeks which includes a Maitland and Mulligan Mobilization technique.

#### **Treatment Protocol & Duration:**

- Duration 6 weeks (24 sessions - 4 session/week)
- Mode: Maitland and Mulligan mobilization and conventional treatment

Conventional Treatment: [24, 25]

- Strengthening exercises like repeated toe flexion without shoes, Walking and standing on the outer edge of the foot, toe and heel, toe and heel raise( Performed ten repetition for each exercise )

Group A was treated with Maitland Mobilization with conventional treatment [26]

#### **Procedure [26]**

Conventional exercises and talo-navicular mobilization were offered to Group A participants. In talo-navicular mobilization, a plantar glide of 20 repetitions of 3 sets were given to the navicular while stabilizing the talar neck.

**Table 1 : 6 WEEKS OF MAITLAND MOBILIZATION PROTOCOL**

WEEK	Intervention	
1 week	Maitland's Mobilization, Grade 2 & 3, Conventional treatment	3 Sets / 20 Repetitions
2 week	Maitland's Mobilization, Grade 2 & 3, Conventional treatment	3 Sets / 20 Repetitions
3 week	Maitland's Mobilization, Grade 3, Conventional treatment	3 Sets / 20 Repetitions
4 week	Maitland's Mobilization, Grade 3, Conventional treatment	3 Sets / 20 Repetitions
5 week	Maitland's Mobilization, Grade 4, Conventional treatment	3 Sets / 20 Repetitions
6 week	Maitland's Mobilization, Grade 4, Conventional treatment	3 Sets / 20 Repetitions



**Fig : (A) Maitland Mobilization in Participant with Flatfoot (Plantar Glide), (B) Mulligan Mobilization in Participant with Flatfoot (Plantar Glide)**

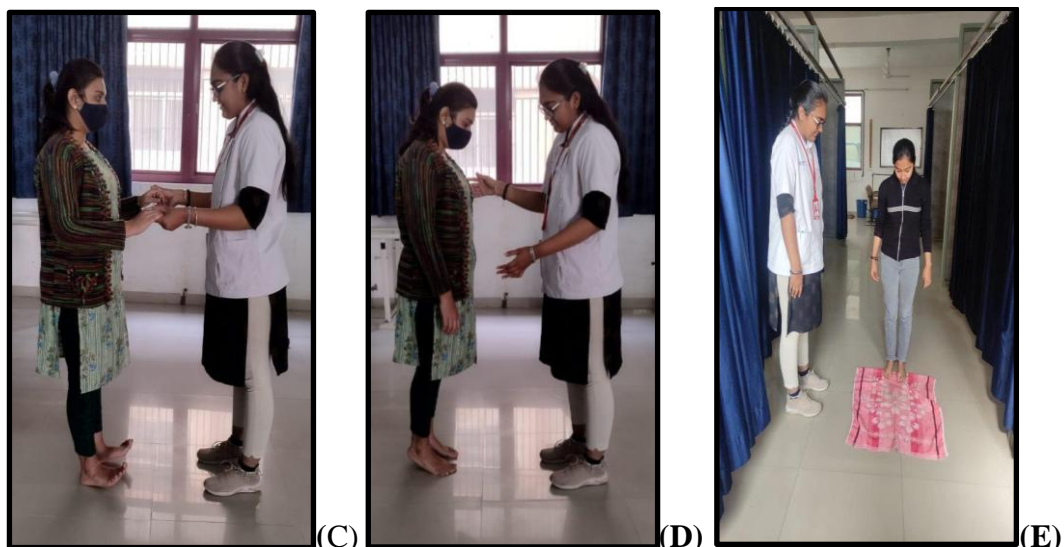
Group B was treated with Mulligan Mobilization with Conventional Treatment

**Procedure [27]**

A prolonged, pain-free mobilizing force is applied by the therapist to the affected joint as the participants simultaneously move actively in the direction of discomfort and movement restriction.

**Table 1 : 6 WEEKS OF MULLIGAN MOBILIZATION PROTOCOL [28]**

WEEK	INTERVENTION	
1 week	Mulligan Mobilization, Conventional treatment	3 Sets / 10 Repetitions
2 week	Mulligan Mobilization, conventional treatment	3 Sets / 10 Repetitions
3 week	Mulligan Mobilization, Conventional treatment	3 Sets / 10 Repetitions
4 week	Mulligan Mobilization, Conventional treatment	3 Sets / 10 Repetitions
5 Week	Mulligan Mobilization, Conventional treatment	3 Sets / 10 Repetitions
6 Week	Mulligan Mobilization, Conventional treatment	3 Sets / 10 Repetitions

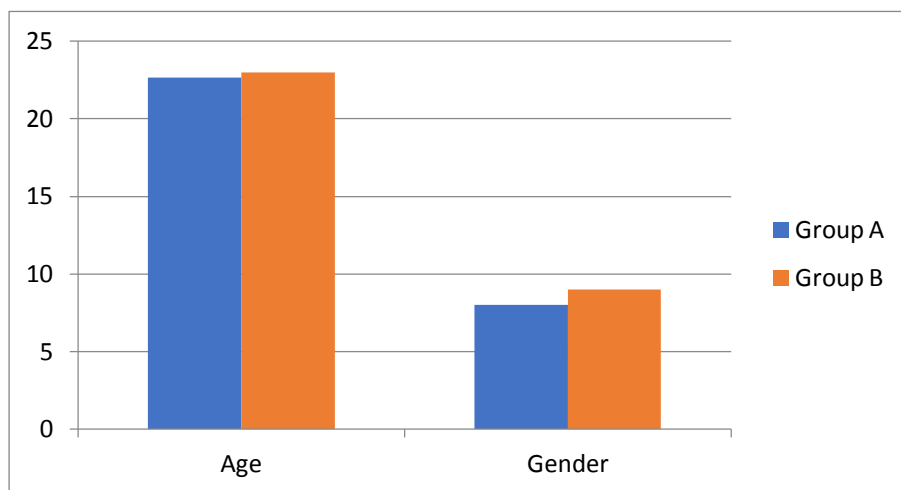


**Fig : (C)Heel rise , (D) Toes rise , (E)Toe Curling**

**Result:**

**Table 3 : Mean Age and Gender of participants in Group A and Group B**

Demographic Details		Group A	Group B
Age	Mean	22.67	23
	SD	± 2.32	± 2.33
Gender	Male	8	9
	Female	7	6

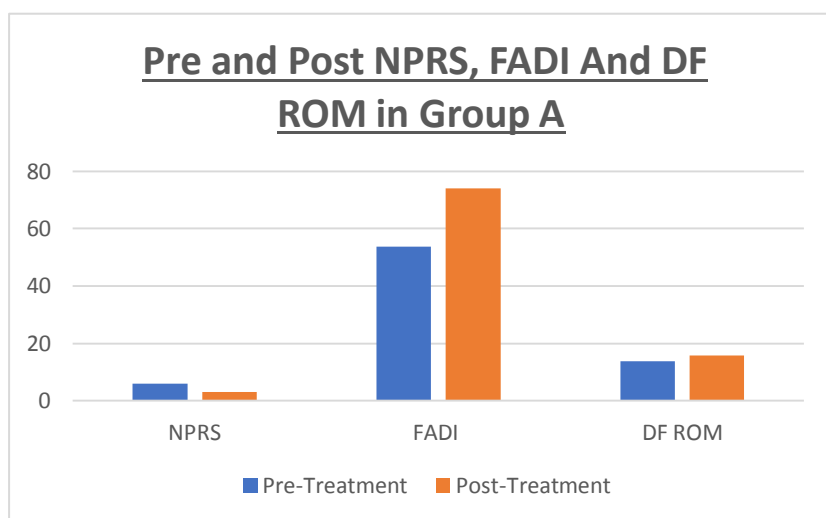


**Graph 1: Mean age and Gender of participants in Group A and Group B**

Graph 1 and Table 3 shows the mean age and gender of participants in Group A (age -  $22.67 \pm 2.32$ , Gender - M-8, F-7) and Group B ( Age -  $23 \pm 2.33$ , Gender - M-9, F-6). No statistically significant difference was found between the ages and gender of the participant in both groups, proving that the groups are homogenous in terms of age and gender.

**Table 4: Pre and Post NPRS, FADI And DF ROM in Group A**

Outcome (Group A)	Pre-Treatment		Post-Treatment		t value	P value
	Mean	SD	Mean	SD		
NPRS	6.067	0.703	3	0.926	14.869	0.034
FADI	53.8	1.373	74	1.558	-54.929	0.04
DF ROM	13.87	1.125	15.867	1.06	-10.247	0.001



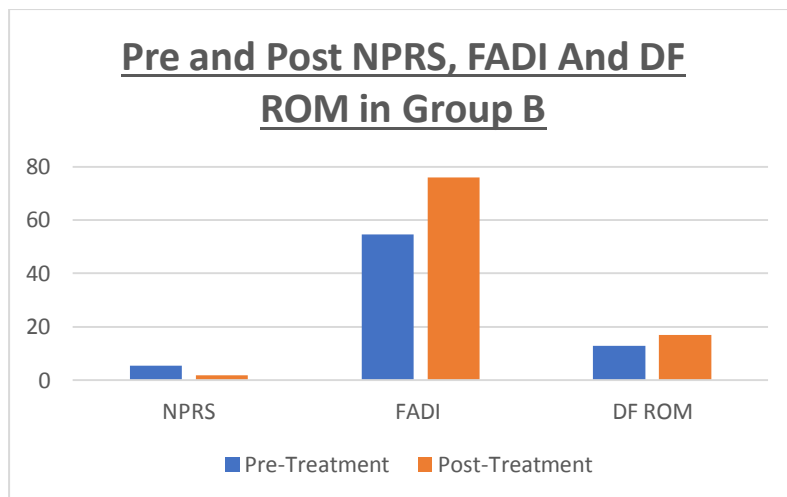
**Graph 2:Pre and Post NPRS, FADI And DF ROM in Group A**

Table 4 and Graph 2 show the intragroup comparison of pre and post-treatment NPRS (Pre=6.067 ±0.703, Post=3±0.926), FADI (Pre=53.8±1.373 , Post=74±1.558), DF ROM (Pre=13.87±1.125 , Post=15.867±1.06) Score in Group A, where the p value is < 0.05. A statistically significant difference was found between the pre and post-treatment NPRS ,FADI, DF ROM score in Group A

**Table 5: Pre and Post NPRS, FADI And DF ROM in Group B**

Outcome (Group B)	Pre-Treatment		Post-Treatment		t value	P value
	Mean	SD	Mean	SD		
NPRS	5.4	1.404	1.933	0.798	16.102	0.000
FADI	54.6	2.197	76	1.000	-48.081	0.009
DF ROM	13	1.927	17	1.603	-15.492	0.000





**Graph 3: Pre and Post NPRS, FADI And DF ROM in Group B**

Table 5 and Graph 3 shows intragroup comparison of pre and post-treatment NPRS (Pre=5.4 ±1.404, Post=1.933±0.798), FADI (Pre=54.6±2.197 , Post=76±1), DF ROM (Pre=13±1.927 , Post=17±1.603) Score in Group B, where the p value is < 0.05. It shows that there is statistically significant difference between the pre and post-treatment NPRS ,FADI, DF ROM score in group B.

## DISCUSSION

The present study indeed compares the effectiveness of Maitland Mobilization versus Mulligan Mobilization along with conventional treatment programs in increasing ankle dorsiflexion, reducing pain and increasing medial arch in participants with Flatfoot in the Midtarsal joint.

Flatfoot was prevalent in 26.5% of men and 25.7% of women; according to Otsuka R et al.[4]This condition is characterized by a collapsing medial arch, forefoot abduction, talus medial rotation and plantar flexion, eversion of the calcaneus. Adults are typically affected by flatfoot. [13,14]

Thirty participants in this study were divided into two groups at random (lottery method) based on the inclusion and exclusion criteria. Following that, a general physical examination and demographic information were used to evaluate each participant. As outcome measures in this study, the Foot & Ankle Disability Index (FADI), the Numerical Pain Rating Scale (NPRS), and the Goniometer (Smart Protractor App) were all used. Following that, Group A received treatment with Maitland Mobilization with conventional treatment for 6 weeks with 4 days/week and AT for 6 weeks with 4 days per week. Group B received the treatment with Mulligan Mobilization with conventional treatment for 6 weeks, 4 days/week & AT for 6 weeks, 4 days/week. The results showed a significant improvement in the outcome measures in the post-treatment phase compared to the pre-treatment phase in Group B (p < 0.05).

In the study NPRS, FADI and Goniometer (Smart Protractor App) were used as an outcome measure. The result showed significant changes in pre and post treatment stages.

Through a significant improvement was found after treatment in both the Group A & B showed improvement in the NPRS, FADI and Ankle ROM of DF (p < 0.05), but the greater improvement seen in Group B than group A.

Thus, the alternative hypothesis is accepted.

The above statement suggests that Maitland and MWM techniques both are effective to reduce pain, increase ankle ROM of DF and MLA.

## CONCLUSION

In the experimental conditions used in the study, both the Groups showed significant reduction in pain, improvement in ankle ROM of DF and MLA. The use of Maitland and Mulligan Mobilization is equally effective, but the Mulligan Mobilization is more effective than Maitland mobilization and can be applied along with conventional exercise programs in Flatfoot participants.

### Limitation of the study:

- The study included a small sample size.
- Selected samples were from Visnagar only

### Future recommendations of the study:

- Study can be revised including larger sample size.
- Further studies can be taken up with different interventions for improving exercise tolerance and endurance of low back pain among bus drivers.
- Study can be revised among the general population.
- Same protocol can be used for other conditions.

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