

# Clinical Trial Protocol

## Iranian Registry of Clinical Trials

12 Sep 2026

### Comparison of the Effects of Vibratory Foam Rolling and PNF Stretching on Calf Muscles Flexibility, Active joint position sense, and Dynamic Balance in Female Athletes with Chronic Ankle Instability in High-Impact Sports

#### Protocol summary

##### Study aim

The purpose of this study is to compare the immediate effect of vibrating foam rolling versus PNF stretching on calf muscle flexibility, ankle proprioception, and dynamic balance among female athletes in high-impact sports suffering from chronic ankle instability.

##### Design

In this single-blind, randomized crossover trial (n=23), participants recruited via purposive sampling from Shiraz sports clubs will receive both interventions in a randomized sequence. A 48-hour wash-out period will be implemented to prevent carry-over effects, with randomization performed via 'Randomizer' software.

##### Settings and conduct

This randomized crossover trial, conducted at the Shiraz University of Medical Sciences' Rehabilitation Clinic, compares the immediate effects of vibrating foam rolling and PNF stretching on the calf muscles. Both interventions consist of three 60-second sets with 30-second rest intervals. To eliminate bias, variables are measured pre- and post-intervention by a blinded assessor unaware of the sequence.

##### Participants/Inclusion and exclusion criteria

Female athletes ( $\geq 18$  years) playing contact sports (e.g., volleyball, basketball, futsal, kickboxing) 3 times/week were recruited. Inclusion criteria: at least one unilateral ankle sprain in the past year with associated pain/swelling, self-reported instability, and a CAIT score  $\geq 25$ . Exclusion criteria: joint hypermobility, neurovascular or musculoskeletal lower-limb disorders (except ankle sprains), head injury or low back pain (last 6 months), ankle fractures, grade 3 sprains requiring surgery, lower limb surgery (last 12 months), bony restrictions, vestibular/balance disorders, and neuropathies.

##### Intervention groups

Two types of warm-up techniques before exercise:

vibrating foam rolling and PNF stretching.

##### Main outcome variables

Calf Muscles Flexibility, Active joint position sense, and Dynamic Balance

#### General information

##### Reason for update

##### Acronym

##### IRCT registration information

IRCT registration number: **IRCT20241004063260N4**

Registration date: **2026-08-05, 1405/05/14**

Registration timing: **prospective**

Last update: **2026-08-05, 1405/05/14**

Update count: **0**

##### Registration date

2026-08-05, 1405/05/14

##### Registrant information

##### Name

Farzaneh Yazdani

##### Name of organization / entity

##### Country

Iran (Islamic Republic of)

##### Phone

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##### Email address

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##### Recruitment status

**recruiting**

##### Funding source

##### Expected recruitment start date

2026-08-23, 1405/06/01

##### Expected recruitment end date

2026-10-23, 1405/08/01

**Actual recruitment start date**  
empty

**Actual recruitment end date**  
empty

**Trial completion date**  
empty

**Scientific title**  
Comparison of the Effects of Vibratory Foam Rolling and PNF Stretching on Calf Muscles Flexibility, Active joint position sense, and Dynamic Balance in Female Athletes with Chronic Ankle Instability in High-Impact Sports

**Public title**  
Comparing Vibratory foam rolling and a stretching technique to improve ankle function and balance in female athletes with chronic ankle instability participating in high-impact sports

**Purpose**  
Treatment

**Inclusion/Exclusion criteria**  
**Inclusion criteria:**  
Inclusion criteria were: participation in high-impact sports (volleyball, basketball, futsal, kickboxing)  $\geq 3$  times/week; at least one ankle sprain within the past year that caused limited activity for at least one day, self-reported conscious instability in walking or running within the past year, and a score of  $\leq 25$  points on the Cumberland Ankle Instability Tool (CAIT) questionnaire (total score of 30).  
**Exclusion criteria:**  
Exclusion criteria were joint hypermobility, any lower-limb neurovascular or musculoskeletal disorders (excluding ankle sprains), or a history of head injury, back pain within the last 6 months Other exclusion criteria included ankle fracture and Grade III ankle sprains requiring surgery lower limb surgery within the past 12 months, bone limitations, vestibular or balance disorders, and neuropathies.

**Age**  
From **18 years** old

**Gender**  
Female

**Phase**  
N/A

**Groups that have been masked**

- Investigator
- Outcome assessor
- Data analyser

**Sample size**  
Target sample size: **23**

**Randomization (investigator's opinion)**  
Randomized

**Randomization description**  
Randomization and Allocation: Participants were randomly assigned to either the vibrating foam rolling group or the PNF stretching group. A computer-generated random sequence was produced using the "Randomizer" software. The unit of randomization was the individual participant, and no stratification was

applied. Allocation concealment was ensured by keeping the group assignment hidden until the point of intervention. Blinding: To minimize bias, an assessor-blinded design was implemented. The researcher responsible for performing the functional and balance tests was blinded to the group allocation and the specific intervention received by each participant.

#### **Blinding (investigator's opinion)**

Single blinded

#### **Blinding description**

A single-blind design (assessor-blinding method) was employed in this study. To implement this process, the interventions (vibrating foam rolling and PNF stretching) were administered by another individual, and the assessor (the researcher) was not present during the intervention sessions. Pre- and post-test evaluations were conducted by an assessor who was unaware of the specific intervention received by the participants. Furthermore, to prevent the disclosure of group

#### **Placebo**

Not used

#### **Assignment**

Crossover

#### **Other design features**

### **Secondary Ids**

empty

### **Ethics committees**

#### **1**

#### **Ethics committee**

##### **Name of ethics committee**

Research Ethics Committees of Shiraz School of Rehabilitation Sciences

##### **Street address**

Ethics Committee, Vice President for Research, School of Rehabilitation Sciences, Shahid Doran Campus, after Amir-al-momenin Burn Hospital, Sadra Town Road

##### **City**

Shiraz

##### **Province**

Fars

##### **Postal code**

7198754361

#### **Approval date**

2025-07-30, 1404/05/08

#### **Ethics committee reference number**

IR.SUMS.REHAB.REC.1404.014

### **Health conditions studied**

#### **1**

#### **Description of health condition studied**

chronic ankle sprain

#### **ICD-10 code**

M25.37

#### **ICD-10 code description**

Other instability, ankle and foot

## Primary outcomes

### 1

#### Description

calf muscles flexibility: Ankle dorsiflexion range of motion was assessed as an indicator of ankle mobility and calf muscle flexibility.

#### Timepoint

Measurements were performed at baseline (before each intervention session) and immediately after completion of each intervention session.

#### Method of measurement

Ankle dorsiflexion ROM was measured using the Weight-Bearing Lunge Test. The maximum distance between the great toe and the wall while maintaining heel contact was recorded.

## Secondary outcomes

### 1

#### Description

Ankle proprioception (joint position sense) was assessed by measuring the repositioning error at target ankle joint angles.

#### Timepoint

Measurements were performed at baseline (before each intervention session) and immediately after completion of each intervention session.

#### Method of measurement

Joint position sense was measured using the Biodex System 4 Pro. Absolute repositioning error was recorded at target positions of 30° plantarflexion and 20° dorsiflexion.

### 2

#### Description

Dynamic balance was assessed as the ability to maintain postural control during multidirectional reaching tasks.

#### Timepoint

Measurements were performed at baseline (before each intervention session) and immediately after completion of each intervention session.

#### Method of measurement

Dynamic balance was measured using the Y-Balance Test. Maximum reach distances in anterior, posteromedial, and posterolateral directions were recorded and normalized to limb length.

## Intervention groups

### 1

#### Description

Vibratory Foam Roller (VFR): Participants received a single session of vibrating foam rolling intervention. The vibrating foam roller was applied to the gastrocnemius and soleus muscles. The intervention consisted of three

60-second sets with 30 seconds of rest between sets.

#### Category

Rehabilitation

### 2

#### Description

PNF stretch: Participants in this group received a PNF stretching session using the Contract-Relax technique. The intervention was performed on the posterior calf muscles (gastrocnemius and soleus) using a TheraBand. It included an isometric muscle contraction followed by passive stretching assisted by the TheraBand according to the study protocol.

#### Category

Rehabilitation

## Recruitment centers

### 1

#### Recruitment center

##### Name of recruitment center

Clinic of Rehabilitation School, Shiraz University of Medical Sciences

##### Full name of responsible person

Farzaneh Yazdani

##### Street address

Mehr Building, Shahid Chamran Hospital, Shahid Chamran Boulevard

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Shiraz

##### Province

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##### Postal code

7194815644

##### Phone

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rehabdep@sums.ac.ir

## Sponsors / Funding sources

### 1

#### Sponsor

##### Name of organization / entity

Shiraz University of Medical Sciences

##### Full name of responsible person

Mohammad-Hashem Hashempour

##### Street address

Research and Technology Vice-Chancellor, 7th floor, Central building of Shiraz, Zand street

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##### Province

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7134814336

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vcrdep@sums.ac.ir

**Grant name**

**Grant code / Reference number**

**Is the source of funding the same sponsor organization/entity?**

Yes

**Title of funding source**

Shiraz University of Medical Sciences

**Proportion provided by this source**

100

**Public or private sector**

Public

**Domestic or foreign origin**

Domestic

**Category of foreign source of funding**

empty

**Country of origin**

**Type of organization providing the funding**

Academic

**Person responsible for general inquiries**

**Contact**

**Name of organization / entity**

Shiraz University of Medical Sciences

**Full name of responsible person**

Farzaneh Yazdani

**Position**

Assistant professor

**Latest degree**

Ph.D.

**Other areas of specialty/work**

Physiotherapy

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**Position**

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**Name of organization / entity**

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**Position**

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**Latest degree**

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**Sharing plan**

**Deidentified Individual Participant Data Set (IPD)**

Undecided - It is not yet known if there will be a plan to make this available

**Study Protocol**

Undecided - It is not yet known if there will be a plan to make this available

**Statistical Analysis Plan**

Undecided - It is not yet known if there will be a plan to make this available

**Informed Consent Form**

Undecided - It is not yet known if there will be a plan to make this available

**Clinical Study Report**

Undecided - It is not yet known if there will be a plan to make this available

**Analytic Code**

Undecided - It is not yet known if there will be a plan to

make this available  
**Data Dictionary**

Undecided - It is not yet known if there will be a plan to  
make this available