Clinical Trial Protocol
Iranian Registry of Clinical Trials

22 Nov 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 (≥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 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)

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Recruitment status

Recruitment complete

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) ≥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 ≤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

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Province

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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
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Sponsors / Funding sources

1

Sponsor
Name of organization / entity
Shiraz University of Medical Sciences
Full name of responsible person
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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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Other areas of specialty/work

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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