

Clinical Trial Protocol

Iranian Registry of Clinical Trials

12 Sep 2026

Comparison of the effects of reactive neuromuscular training and traditional neuromuscular training on landing kinematics, balance, and performance of football players with anterior cruciate ligament reconstruction.

Protocol summary

Study aim

Investigating and comparing the effect of reactive and traditional neuromuscular exercises on landing kinematics, balance and performance of athletes with anterior cruciate ligament reconstruction

Design

Clinical trial with intervention and control groups, single-blind, randomized, on 30 individuals. Lottery will be used for randomization.

Settings and conduct

Study location: Faculty of Sport and Health Sciences;
Study population: Soccer players with anterior cruciate ligament reconstruction; Type of blinding: One-sided blinding; Method of blinding: Training days of the groups were different.

Participants/Inclusion and exclusion criteria

Inclusion criteria: Subjects should be football players with at least 3 years of professional sports experience; Male players with anterior cruciate ligament reconstruction of superior leg (right); People after 4 months after cruciate ligament surgery; BMI between 18 and 25; Reconstruction surgery on the anterior cruciate ligament with hamstring autograft; Exclusion criteria: injury in the opposite knee; Insufficient range of motion of bending and extension the knee; history of fracture or surgery of lower limb joints and postural disorders of lower limb, spine and soles; history of balance disorders or vestibular system.

Intervention groups

Intervention group: Reactive neuromuscular training;
Control group: Traditional neuromuscular training.
Regarding the training protocols, it should be noted that both groups (traditional neuromuscular training and reactive neuromuscular training group) will perform both designed protocols (traditional and RNT), but with the difference that in the case of the RNT training protocol,

the reactive neuromuscular training group will perform the exercises using a Traband, while in the conventional neuromuscular training group, the Traband will not be used.

Main outcome variables

Landing kinematics; balance; performance

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20251209068260N1**

Registration date: **2026-01-27, 1404/11/07**

Registration timing: **prospective**

Last update: **2026-01-27, 1404/11/07**

Update count: **0**

Registration date

2026-01-27, 1404/11/07

Registrant information

Name

Mohsen Naderi

Name of organization / entity

Tehran university

Country

Iran (Islamic Republic of)

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mohsennaderi5755@gmail.com

Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2026-02-03, 1404/11/14

Expected recruitment end date

2026-03-16, 1404/12/25

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Comparison of the effects of reactive neuromuscular training and traditional neuromuscular training on landing kinematics, balance, and performance of football players with anterior cruciate ligament reconstruction.

Public title

Studying the effect of reactive neuromuscular training on landing kinematics, balance, and performance of football players with anterior cruciate ligament reconstruction

Purpose

Prevention

Inclusion/Exclusion criteria**Inclusion criteria:**

The age of the sample is between 22 and 32 years old. The subjects are football players with at least 3 years of professional sports experience and they train on three sessions Male players with anterior cruciate ligament training (right) People after 4 months after cruciate ligament surgery BMI between 18 and 25 Reconstructive surgery on the anterior cruciate ligament with hamstring autograft Full range of motion of knee flexion and extension.

Exclusion criteria:

Injury to the opposite knee Fractures or surgery of lower limb joints and postural disorders of the lower limbs, spine, and feet History of balance or vestibular system disorders.

Age

From **22 years** old to **32 years** old

Gender

Male

Phase

N/A

Groups that have been masked

- Participant

Sample size

Target sample size: **30**

Randomization (investigator's opinion)

Randomized

Randomization description

Using the drawing method; the subjects' names are written on separate pieces of paper and placed in a container. Then, the subjects' names are randomly drawn and placed in the intervention or control groups, respectively.

Blinding (investigator's opinion)

Single blinded

Blinding description

Subjects are blinded to grouping, and the groups'

training sessions are conducted on different days.

Placebo

Not used

Assignment

Parallel

Other design features**Secondary Ids**

empty

Ethics committees**1****Ethics committee****Name of ethics committee**

Ethics committee of the Faculty of Sports and Health Sciences

Street address

Opposite Tehran University Alley, Between 15th and 16th Streets, Above Jalal Al-Ahmad Intersection, North Kargar Street

City

Tehran

Province

Tehran

Postal code

۱۴۱۷۹۳۵۸۴۰

Approval date

2024-09-09, 1403/06/19

Ethics committee reference number

IR.UT.SPORT.REC.1403.073

Health conditions studied**1****Description of health condition studied**

Football players with anterior cruciate ligament reconstruction

ICD-10 code**ICD-10 code description****Primary outcomes****1****Description**

Angles of the knee and hip joints in the sagittal plane at initial contact and maximum knee flexion.

Timepoint

Before and after the intervention

Method of measurement

In order to investigate the kinematics of the knee, leg and thigh, the Vaikan motion analysis device with Bonita 10C cameras made in England with a sampling rate of 240 Hz will be used in the sports biomechanics laboratory of the Faculty of Sports and Health Sciences of Tehran University.

2

Description

Knee and hip joint angles in the frontal plane at initial contact and maximum knee flexion

Timepoint

Before and after the intervention

Method of measurement

In order to investigate the kinematics of the knee, leg and thigh, the Vaikan motion analysis device with Bonita 10C cameras made in England with a sampling rate of 240 Hz will be used in the sports biomechanics laboratory of the Faculty of Sports and Health Sciences of Tehran University.

3

Description

Angles of the knee and hip joints in the horizontal plane at initial contact and maximum knee flexion.

Timepoint

Before and after the intervention

Method of measurement

In order to investigate the kinematics of the knee, leg and thigh, the Vaikan motion analysis device with Bonita 10C cameras made in England with a sampling rate of 240 Hz will be used in the sports biomechanics laboratory of the Faculty of Sports and Health Sciences of Tehran University.

4

Description

Static and dynamic balance (anterior-posterior stability index, internal-external stability index, overall balance index).

Timepoint

Before and after the intervention

Method of measurement

The Biodex balance test is used at stability level 12 as static balance, and scores obtained at stability level 4 are used for dynamic balance.

5

Description

Knee function

Timepoint

Before and after the intervention

Method of measurement

The hopping test will be used to measure performance.

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group: Theraband and mini-loop elastics will be used to perform reactive neuromuscular exercises; in

this case, the trainer will increase the individual's incorrect movement pattern by using elastic bands and with a low load, and the exerciser will be asked not to allow the trainer to aggravate his movement inaccuracy. Theraband will be used in the single-leg squat, Romanian deadlift, standing lunges, single-leg squat on a bosu ball, and side squat assignments, and the mini-loop elastics will be used in the wall squat, kettlebell deadlift, and step up and down assignments.

Category

Prevention

2

Description

Control group: It should be noted that the control group will also perform both designed protocols (traditional and RNT), but with the difference that the Traband will not be used in the case of the conventional neuromuscular training group.

Category

Prevention

Recruitment centers

1

Recruitment center

Name of recruitment center

Faculty of Sports Sciences and Health, University of Tehran

Full name of responsible person

Mohammad Hossein Alizadeh

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Sponsors / Funding sources

1

Sponsor

Name of organization / entity

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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
Tehran University
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

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Name of organization / entity
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Position
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Sharing plan

Deidentified Individual Participant Data Set (IPD)
No - There is not a plan to make this available
Justification/reason for indecision/not sharing IPD
I have no decision
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