Clinical Trial Protocol
Iranian Registry of Clinical Trials

10 Jun 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 extention 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 unversity

Country
Iran (Islamic Republic of)

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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
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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
Tehran University
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

Contact

Name of organization / entity
Tehran University

Full name of responsible person
Mohsen Naderi

Position
Student

Latest degree
Master

Other areas of specialty/work
Sport injuries and corrective exercise

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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