Clinical Trial Protocol
Iranian Registry of Clinical Trials

28 Oct 2026

Effects of National Academy of Sports Medicine (NASM)-Based Corrective Exercises and Knee-Focused Neuromuscular Training on Return-to-Sport Tests and Lower Limb Muscle Electrical Activity in Young Volleyball Players Following Anterior Cruciate Ligament Reconstruction

Protocol summary

Study aim

Effects of National Academy of Sports Medicine (NASM)-Based Corrective Exercise and Knee-Oriented Neuromuscular Training on Return-to-Sport Performance and Lower Extremity Muscle Activity in Young Volleyball Athletes After ACL Reconstruction

Design

A randomized clinical study, single-blind, parallel-group, 45 elderly randomized to 2 intervention groups and a control group through web-based randomization

Settings and conduct

Following physician evaluation and eligibility screening, participants provided written consent and were assigned to either an intervention or control group. In this single-blind study, the outcome assessor was unaware of group allocation. The 8-week program (three 60-min sessions/week) was conducted at Kharazmi University's Movement Analysis Laboratory

Participants/Inclusion and exclusion criteria

Inclusion Criteria: Being within the age range of 18 to 30 years. Having a history of unilateral anterior cruciate ligament (ACL) . At least 6 months and at most 24 months having passed since the ACL reconstruction surgery. Absence of severe pain, acute inflammation, or significant range of motion limitation at the time of testing. Having adequate functional range of motion of the knee joint, particularly full functional flexion and extension. Exclusion Criteria: Bilateral ACL reconstruction or a history of ACL rupture in the contralateral limb; or meniscal tear requiring recent intervention. History of other knee surgery within the past 6 months; recent arthroscopy; or active pain/swelling that prevents participation in exercises. Neurological, cardiovascular, or metabolic diseases

Intervention groups

Group 1: NASM corrective exercises (3 sessions per week for 8 weeks). Group 2: Knee-focused neuromuscular training (3 sessions per week for 8 weeks). Control group: No training.

Main outcome variables

Lower limb muscle Electromyography, Return-to-sport functional tests

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20180627040251N21**
Registration date: **2026-08-04, 1405/05/13**
Registration timing: **prospective**

Last update: **2026-08-04, 1405/05/13**
Update count: **0**

Registration date

2026-08-04, 1405/05/13

Registrant information

Name

Hassan Sadeghi

Name of organization / entity

Kharazmi University

Country

Iran (Islamic Republic of)

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date
2026-08-11, 1405/05/20
Expected recruitment end date
2026-09-11, 1405/06/20
Actual recruitment start date
empty
Actual recruitment end date
empty
Trial completion date
empty

Scientific title
Effects of National Academy of Sports Medicine (NASM)-Based Corrective Exercises and Knee-Focused Neuromuscular Training on Return-to-Sport Tests and Lower Limb Muscle Electrical Activity in Young Volleyball Players Following Anterior Cruciate Ligament Reconstruction

Public title
Comparison of the Effects of Corrective Exercises and Neuromuscular Exercises on Lower Limb Function and Muscle Activity in Young Volleyball Players Following ACL Reconstruction
Purpose
Treatment
Inclusion/Exclusion criteria
Inclusion criteria:
Being male and within the age range of 18 to 30 years Having a history of unilateral anterior cruciate ligament (ACL) reconstruction using the standard surgical technique. At least 6 months and at most 24 months having passed since the anterior cruciate ligament reconstruction surgery. Completion of the initial phase of medical rehabilitation and receiving clearance from a specialist physician to participate in sports activities. Absence of severe pain, acute inflammation, or significant range of motion limitation at the time of testing. Ability to perform single-leg landing tasks and return-to-sport tests without severe pain or a strong feeling of instability. Having adequate functional range of motion of the knee joint, particularly full functional flexion and extension.
Exclusion criteria:
Bilateral ACL reconstruction or a history of ACL rupture in the contralateral limb; or meniscal tear requiring recent intervention. History of other knee surgery within the past 6 months; recent arthroscopy; or active pain/swelling that prevents participation in exercises. Neurological, cardiovascular, or metabolic diseases that affect exercise performance (as diagnosed by a physician). Active knee instability on clinical examination, or severe kinesiophobia that makes task performance impossible. Use of medications affecting neuromuscular function that cause rapid changes.
Age
From **18 years** old to **30 years** old
Gender
Male

Phase
N/A
Groups that have been masked
- Outcome assessor

Sample size
Target sample size: **45**
Randomization (investigator's opinion)
Randomized
Randomization description
In this study, simple randomization was used to assign participants to three groups (two intervention groups and one control group). The randomization sequence was generated using SPSS statistical software and sealed envelopes were used to ensure allocation concealment. Thus, there was no bias or side effects in the group allocation process. How to create a random sequence: A list of numbers from 1 to 45 (the total number of participants) is prepared. Using a randomization tool (such as random.org or a random number table), each number is completely randomly assigned to one of three groups (A: intervention 1, B: intervention 2, C: control). Result: A random sequence such as [A, C, B, A, B, C, ...] up to 45 people. How subjects are entered: Participants are entered in the order they register (first, second, etc.). Each person is assigned based on their position in the sequence (e.g., person 1 to A, person 2 to C, etc.). To ensure concealment, the sequence is placed in sealed envelopes and opened sequentially.
Blinding (investigator's opinion)
Single blinded
Blinding description
In this study, the outcome assessor is blind to the groups' randomization and interventions receiving by participants. in this way, during the evaluation before and after the intervention protocol, they do not make mistakes in their judgments in favor of a specific therapeutic intervention.
Placebo
Not used
Assignment
Parallel
Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee
Name of ethics committee
Ethical Committee of Kharazmi University-Iran
Street address
Enghlab- Mofateh St. Tehran
City
Tehran
Province
Tehran
Postal code
1491115719
Approval date
2026-06-20, 1405/03/30
Ethics committee reference number

IR.KHU.REC.1405.050

Health conditions studied

1

Description of health condition studied
anterior cruciate ligament Injury
ICD-10 code
S83.5
ICD-10 code description
Sprain of cruciate ligament of knee

Primary outcomes

1

Description
Lower limb muscle Electromyography
Timepoint
Beginning and end of exercises duration
Method of measurement
Electromyography device

Secondary outcomes

1

Description
Return-to-sport functional tests
Timepoint
Before and after exercise protocols
Method of measurement
Single leg hop for distance, Crossover hop for distance, 6-m timed hop ,Triple hop for distance

Intervention groups

1

Description
Intervention group 1: The National Academy of Sports Medicine (NASM) training group participated in an 8-week program, with three sessions per week. Each session included foam rolling for muscle inhibition, static and dynamic stretching, isolated strengthening of underactive muscles using resistance exercises, and full-body functional movements to coordinate movement patterns
Category
Rehabilitation

2

Description
Intervention group: The knee-focused neuromuscular training program was conducted for 8 weeks, with three sessions per week. The emphasis was on dynamic joint stabilization, anticipatory muscle activation, and reactive motor control. Each session included a dynamic warm-up, balance and perturbation exercises on stable and unstable surfaces, plyometric and landing retraining with visual and verbal feedback, and agility drills involving directional changes and responses to stimuli
Category
Rehabilitation

3

Description
Control group: This group did not receive any training or intervention during the study period.
Category
Rehabilitation

Recruitment centers

1

Recruitment center
Name of recruitment center
Faculty of Sport Sciences. Kharazmi University
Full name of responsible person
Azam Ahmadi
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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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Web page address
https://research.khu.ac.ir/en

Grant name
Grant code / Reference number
Is the source of funding the same sponsor organization/entity?
Yes
Title of funding source
Kharazmi 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
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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
It will be sent if requested
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