Clinical Trial Protocol
Iranian Registry of Clinical Trials

22 Nov 2026

A comparison of the effects of six weeks of neuromuscular training and core stability training on dynamic balance, functional movement, and knee joint proprioception in young taekwondo athletes with patellofemoral pain syndrome (PFPS)

Protocol summary

Study aim
Effects of six weeks of neuromuscular training and core stability training on dynamic balance, functional movement, and knee joint proprioception in young taekwondo athletes with Patellofemoral Pain Syndrome

Design
Randomized, single-blind, parallel-group clinical trial in which participants are allocated to study groups using a simple randomization (drawing) method

Settings and conduct
Study location: Barsam Javaneh Taekwondo Academy, located at Molla Fathollah Street, Moshfegh Kashani Street, Kashan, Iran; Study population: young taekwondo athletes with patellofemoral pain syndrome; Blinding type: single-blind; Blinding method: the outcome assessor will be blinded to group allocation.

Participants/Inclusion and exclusion criteria
Inclusion criteria: Presence of anterior knee pain during at least two daily or sports-related activities; diagnosis of Patellofemoral Pain Syndrome (PFPS) by a physiotherapist or sports medicine specialist; no history of severe knee injury within the past six months; regular participation in taekwondo training at least three sessions per week. Exclusion criteria: History of lower-extremity surgery; history of severe knee injury (ligament, meniscus injury, or fracture) within the past six months

Intervention groups
Intervention group: Neuromuscular training and core stability exercises for 6 weeks, 3 sessions per week, aimed at improving dynamic balance, functional movement, and knee proprioception in taekwondo athletes with patellofemoral pain syndrome. Control group: No specific training intervention; participants will continue their usual taekwondo training during the 6-week study period

Main outcome variables
Dynamic Balance; Functional Movement Performance; Knee Joint Proprioception

General information

Reason for update

Acronym

IRCT registration information
IRCT registration number: **IRCT20260606069658N1**
Registration date: **2026-08-01, 1405/05/10**
Registration timing: **prospective**

Last update: **2026-08-01, 1405/05/10**
Update count: **0**

Registration date
2026-08-01, 1405/05/10

Registrant information

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Matin Zohrei

Name of organization / entity
The university of arak

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Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2026-08-22, 1405/05/31

Expected recruitment end date

2026-08-25, 1405/06/03

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

A comparison of the effects of six weeks of neuromuscular training and core stability training on dynamic balance, functional movement, and knee joint proprioception in young taekwondo athletes with patellofemoral pain syndrome (PFPS)

Public title

The effect of neuromuscular training and core stability on patellofemoral pain syndrome

Purpose

Education/Guidance

Inclusion/Exclusion criteria

Inclusion criteria:

Presence of anterior knee pain during at least two daily or sports-related activities (e.g., squatting, running, stair climbing, or prolonged sitting). Diagnosis of Patellofemoral Pain Syndrome (PFPS) by a physiotherapist or sports medicine specialist. Regular participation in taekwondo training sessions at least three times per week

Exclusion criteria:

History of severe knee injury (e.g., ligament injury, meniscal injury, or fracture) within the previous six months History of lower-extremity surgery

Age

From **18 years** old to **25 years** old

Gender

Male

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **36**

Randomization (investigator's opinion)

Randomized

Randomization description

Block randomization will be used, with the individual participant as the unit of randomization. The random allocation sequence will be generated using a random number table, and following baseline assessments, participants will be assigned to one of three groups: the neuromuscular training group, the core stability training group, or the control group (no intervention or routine training). Allocation concealment will be ensured using sequentially numbered, opaque, sealed envelopes. Outcome assessors will be blinded to group allocation

Blinding (investigator's opinion)

Not blinded

Blinding description

Placebo

Not used

Assignment

Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee

Ethics Committee of Arak University

Street address

Sardasht Boulevard, Basij Square

City

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Province

Markazi

Postal code

۳۸۱۸۱۷۵۸۴۶

Approval date

2026-03-16, 1404/12/25

Ethics committee reference number

IR.ARAKU.REC.1404.072

Health conditions studied

1

Description of health condition studied

Patellofemoral Pain Syndrome

ICD-10 code

M22.2

ICD-10 code description

Patellofemoral disorders

Primary outcomes

1

Description

Dynamic Balance:

Timepoint

Baseline (before the intervention) and after 6 weeks of intervention

Method of measurement

Dynamic balance will be assessed using the Y Balance Test (YBT)

2

Description

Functional Movement

Timepoint

Baseline (before the intervention) and after 6 weeks of intervention.

Method of measurement

using the Single-Leg Squat Test (SLST) and the Single-Leg Hop Test (SLH

3

Description
Knee Joint Proprioception
Timepoint
Baseline (before the intervention) and after 6 weeks of intervention
Method of measurement
Knee joint proprioception will be assessed using the Joint Position Reproduction Test (JPRT)

Secondary outcomes

empty

Intervention groups

1

Description
Intervention group 1: Neuromuscular Training ،Participants in this group will perform a neuromuscular training program for 6 weeks, 3 sessions per week. Each session will last approximately 45–60 minutes and will include warm-up exercises, balance training, neuromuscular control exercises, proprioceptive exercises, lower-extremity functional exercises, and cool-down. All sessions will be supervised by the researcher
Category
Rehabilitation

2

Description
Intervention group 2: Core Stability Training،Participants in this group will perform a core stability training program for 6 weeks, 3 sessions per week. Each session will last approximately 45–60 minutes and will include warm-up exercises, core muscle strengthening exercises, trunk control exercises, balance exercises, and cool-down. All sessions will be supervised by the researcher
Category
Rehabilitation

3

Description
Control group: Participants in the control group will not receive either of the study interventions during the 6-week study period and will continue their routine taekwondo training. After completion of the study, the training program will be made available to them if requested
Category
N/A

Recruitment centers

1

Recruitment center
Name of recruitment center
Barsam javaneh taekwondo academy
Full name of responsible person
Matin Zohrei
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Barsam Javaneh Taekwondo Academy, Moshfegh Kashani Street, Molla Fathollah Street
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Sponsors / Funding sources

1

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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
The University of Arak
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
The university of arak

Full name of responsible person
Matin Zohrei
Position
Master student
Latest degree
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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