

Clinical Trial Protocol

Iranian Registry of Clinical Trials

10 Jun 2026

Comparison of the Effects of Plyometric Training With and Without Symmetry Exercises on Lower Limb Performance and Knee Injury Risk Factors in Karate Athletes

Protocol summary

Study aim

Comparison of the effect of plyometric training with and without symmetric training on lower extremity function and knee injury risk factors in karatekas

Design

Randomized controlled clinical trial with parallel groups, non-blinded, with a sample size of 45 participants who were randomly allocated into three groups.

Settings and conduct

This study will be conducted at two sports clubs, Avang and Hese Khob, in Mashhad city. The intervention groups will perform their training sessions twice a week for eight weeks at the clubs. The control group will not receive any training program during this period.

Participants/Inclusion and exclusion criteria

Inclusion criteria: regular karate activity at least 3 sessions per week; having at least 1 year of training experience; aged between 10 to 17 years; informed consent of participants and parents; no cardiorespiratory limitations; not participating in another training protocol

Intervention groups

First group: plyometric training for eight weeks, two sessions per week. Second group: plyometric training combined with symmetric training for eight weeks, two sessions per week. Third group: control group without any interventional training program.

Main outcome variables

Lower limb asymmetry; lower limb reaction time; agility; vertical jump; horizontal jump; knee proprioception; knee range of motion; LESS test score; Mawashi Geri kicking ability test

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20260604069637N1**

Registration date: **2026-06-08, 1405/03/18**

Registration timing: **registered_while_recruiting**

Last update: **2026-06-08, 1405/03/18**

Update count: **0**

Registration date

2026-06-08, 1405/03/18

Registrant information

Name

Atekeh Keivani

Name of organization / entity

University of Guilan, Faculty of Physical Education and Sports Sciences

Country

Iran (Islamic Republic of)

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Recruitment status

recruiting

Funding source

Expected recruitment start date

2026-05-01, 1405/02/11

Expected recruitment end date

2026-07-09, 1405/04/18

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Comparison of the Effects of Plyometric Training With

and Without Symmetry Exercises on Lower Limb Performance and Knee Injury Risk Factors in Karate Athletes

Public title

Investigating the effect of two types of training programs on lower limb function and knee injury risk in karatekas

Purpose

Supportive

Inclusion/Exclusion criteria

Inclusion criteria:

Regular karate activity at least 3 sessions per week- Having at least 1 year of training experience- Aged between 10 to 17 years- Informed consent of participants and parents- No cardio respiratory limitations- Not participating in another training protocol

Exclusion criteria:

Age

From **10 years** old to **17 years** old

Gender

Both

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **45**

Randomization (investigator's opinion)

Randomized

Randomization description

Random allocation of groups was performed using sealed envelopes containing numbers. The person who drew the first number was assigned to the plyometric training with symmetric training group, the person who drew the second number was assigned to the plyometric training group, and the third person was assigned to the control group. Allocation concealment was maintained by an independent individual so that the researchers conducting the study were unaware of future allocations. After allocation was completed, the researchers were aware of the group assignments, and due to the nature of the intervention (exercise training), blinding of participants was not possible.

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 Guilan University

Street address

Unit 4, No. 168, Soroush 39 St., Moallem 17 St., Maidan-e Moallem, Mashhad, Iran

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Approval date

2026-05-25, 1405/03/04

Ethics committee reference number

IR.GUILAN.REC.1405.028

Health conditions studied

1

Description of health condition studied

Knee injury risk factors and lower extremity function in karatekas

ICD-10 code

ICD-10 code description

Primary outcomes

1

Description

Lower limb asymmetry

Timepoint

Pre-test (before the intervention) and post-test (after eight weeks of training)

Method of measurement

Calculation of limb symmetry index using single-leg jump test and triple hop test. The participant stands on the tested leg with hands behind the lower back, jumps as far as possible, lands on the same leg, and maintains balance for two seconds. Measurement is based on the distance from toe tip at start to heel after landing in centimeters. Each athlete performs three attempts per leg and the best result is selected.

2

Description

Lower Limb Reaction Time

Timepoint

Pre-test and post-test

Method of measurement

Video recording using mobile phone and On Form application at 720p quality and 240 fps. An LED light serves as a visual stimulus that turns on randomly between 2 to 10 seconds. The test includes three types of movements (standing, single-leg balance, and cutting movement) under single-task and dual-task conditions. Reaction time is calculated from the first frame of hand or body movement and converted to seconds.

3

Description

Agility

Timepoint

Pre-test and post-test

Method of measurement

Modified T-test with a distance of 20 meters. The subject runs from the starting line to cone B at a distance of 5 meters and touches its base with the right hand. Then, using side steps, moves to cone C (left) and cone D (right) and touches their bases. Finally, returns backward to the starting line. Each subject has two attempts and the best time in seconds is recorded.

4

Description

Vertical Jump

Timepoint

Pre-test and post-test

Method of measurement

First, standing reach height is recorded. The athlete marks the fingertip point with an outstretched hand upward. Then the athlete performs an explosive vertical jump and touches the wall at the highest point. The test result is calculated based on the difference between standing reach height and jump height. The best result from two attempts is recorded.

5

Description

Horizontal Jump

Timepoint

Pre-test and post-test

Method of measurement

The subject stands behind the starting line and performs a double-leg jump to achieve maximum horizontal distance. Landing must be controlled with balance maintained on the feet for three seconds. The distance from the starting line to the heel of the rearmost foot at landing is measured in centimeters. Each subject has two attempts and the best record is recorded.

6

Description

Knee Proprioception

Timepoint

Pre-test and post-test

Method of measurement

The subject sits on the edge of a bed with the knee at 90 degrees flexion. The goniometer is aligned with the axis on the lateral femoral epicondyle. The knee is placed at 30 degrees flexion, the subject closes their eyes. After 5 seconds, the subject is asked to actively return the leg to the same angle. This process is repeated three times. The same procedure is performed for 45 degrees flexion.

7

Description

Knee Range of Motion

Timepoint

Pre-test and post-test

Method of measurement

The subject lies in a supine position. The goniometer is aligned with three anatomical points: the greater trochanter (stationary arm), the lateral femoral epicondyle (axis), and the lateral malleolus (movable arm). Active flexion range from 0 to 135 degrees and active extension range from 0 to 10 degrees are measured.

8

Description

LESS Test

Timepoint

Pre-test and post-test

Method of measurement

The subject stands on a 30 cm high box. A target line is marked on the floor at a distance equal to half the subject's height. The subject jumps forward from the box and lands with both feet simultaneously next to the target line. Immediately, they jump for maximum vertical height. Two cameras record the frontal and lateral views of landing. Scoring is performed using the specific LESS form.

9

Description

Mawashi Geri Kicking Ability Test

Timepoint

Pre-test and post-test

Method of measurement

The subject stands in a ready position facing the target bag and is required to perform the maximum number of Mawashi Geri kicks with speed within 10 seconds. The number of correctly performed kicks within 10 seconds is recorded as the final score.

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group: plyometric training for eight weeks, two sessions per week.

Category

Behavior

2

Description

Intervention group: plyometric training combined with symmetric training for eight weeks, two sessions per week.

Category

Behavior

3

Description

Control group: control group. Participants in this group do not receive any interventional training program and only participate in pre-test and post-test.

Category

N/A

Recruitment centers

1

Recruitment center

Name of recruitment center

Avang Sports Club, Mashhad

Full name of responsible person

Azra yousefian

Street address

No. 22, Azadeh St., adjacent to Javad al-Aemeh Mosque, Mashhad, Iran

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Sponsors / Funding sources

1

Sponsor

Name of organization / entity

University of Guilan

Full name of responsible person

Ali Basti

Street address

5th Kilometer of Tabriz Highway, University of Guilan, Faculty of Sports Sciences, Rasht, Iran

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Phone

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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

University of Guilan

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

University of Guilan, Faculty of Sports Sciences

Full name of responsible person

Atekeh Keivani

Position

MSc Student

Latest degree

Bachelor

Other areas of specialty/work

Health Promotion

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Latest degree

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Other areas of specialty/work

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Person responsible for updating data**Contact****Name of organization / entity**

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Atekeh Keivani

Position

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Latest degree

Bachelor

Other areas of specialty/work

Health Promotion

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Razavi Khorasan

Postal code**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

There is no plan to share individual participant data due to confidentiality concerns and the academic nature of this master's thesis research.

Study Protocol

No - There is not a plan to make this available

Statistical Analysis Plan

No - There is not a plan to make this available

Informed Consent Form

No - There is not a plan to make this available

Clinical Study Report

Not applicable

Analytic Code

No - There is not a plan to make this available

Data Dictionary

Not applicable