Clinical Trial Protocol
Iranian Registry of Clinical Trials

22 Nov 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
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Recruitment status
Recruitment complete
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
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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
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Full name of responsible person
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5th Kilometer of Tabriz Highway, University of Guilan, Faculty of Sports Sciences, Rasht, Iran
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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
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Full name of responsible person
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MSc Student
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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
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