Clinical Trial Protocol
Iranian Registry of Clinical Trials

09 Nov 2026

Effect of Comprehensive Corrective Exercises and Jumping Rope on Balance and Proprioception of the Ankle in Female Students with Ankle Pronation

Protocol summary

Study aim

The main aim of this study was to investigate the **effect of comprehensive corrective exercises and rope skipping on improving balance and ankle proprioception in female students with ankle pronation**.

Design

This study was a randomized, three-group, parallel-design, double-blind, phase 1 clinical trial conducted on 45 female students with ankle pronation.

Settings and conduct

The training groups completed corrective exercise and rope skipping sessions under the supervision of a specialist at the Sports School of Quchan for six weeks, three sessions per week, each lasting 60 minutes. The control group received no intervention during this period. Participants were asked to inform the coach if unable to attend sessions. Missing two consecutive or three total sessions resulted in exclusion from the study. The study followed ethical principles, with informed consent obtained and confidentiality maintained.

Participants/Inclusion and exclusion criteria

Inclusion Criteria: Female students aged 10 to 12 years Navicular drop greater than 10 mm Grade 2 flat foot No history of injury, surgery, or fracture in the lower limbs Free from any specific diseases Exclusion Criteria: History of fracture or surgery in lower limb joints Postural disorders such as bowlegs (genu varum), knock knees (genu valgum), or scoliosis Neurological disorders or vestibular system disorders Acute ankle sprain symptoms such as swelling or bruising Use of medication for ankle problems Participation in a rehabilitation program in the past six months

Intervention groups

Corrective Exercise Group (15 participants), Rope Skipping Group (15 participants), Control Group (15 participants)

Main outcome variables

1. Dynamic Balance 2. Proprioception of Ankle Plantar Flexion 3. Proprioception of Ankle Inversion

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20110803007211N5**
Registration date: **2025-01-06, 1403/10/17**
Registration timing: **prospective**

Last update: **2025-01-06, 1403/10/17**
Update count: **0**

Registration date

2025-01-06, 1403/10/17

Registrant information

Name

Name of organization / entity

Country

Iran (Islamic Republic of)

Phone

05714413512

Email address

mseyedahmadi@gmail.com

Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2025-01-09, 1403/10/20

Expected recruitment end date

2025-01-24, 1403/11/05

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date
empty

Scientific title
Effect of Comprehensive Corrective Exercises and Jumping Rope on Balance and Proprioception of the Ankle in Female Students with Ankle Pronation

Public title
Evaluating the Effect of Comprehensive Corrective Exercises and Rope Skipping on Ankle Function in Students with Pronation Disorder

Purpose
Supportive

Inclusion/Exclusion criteria

Inclusion criteria:
Female students aged 10 to 12 years Navicular drop greater than 10 mm Grade 2 flat foot No history of injury, surgery, or fracture in the lower limbs Free from any specific diseases

Exclusion criteria:
History of fracture or surgery in lower limb joints Postural disorders such as bowlegs (genu varum), knock knees (genu valgum), or scoliosis Acute ankle sprain symptoms such as swelling or bruising

Age
From **10 years** old to **12 years** old

Gender
Female

Phase
N/A

Groups that have been masked

- Participant
- Outcome assessor
- Data analyser

Sample size
Target sample size: **45**

Randomization (investigator's opinion)
Randomized

Randomization description
Using **cluster sampling**, three schools were randomly selected, and students aged **10 to 12 years** were screened based on the criteria. The sample size was calculated using **G Power software** for **three groups** (effect size **0.25**, alpha **0.05**, power **0.95**) as **251 participants**, and **260 students** were selected to account for dropouts. After screening, **64 female students** with **ankle pronation** were identified, and **45 participants** were randomly assigned to **three groups**: **Corrective Exercise (15)**, **Rope Skipping (15)**, and **Control (15)**.

Blinding (investigator's opinion)
Double blinded

Blinding description
Participants, outcome assessors, and data analysts will be blinded to the allocation of study groups. The blinding process will be implemented as follows: the assignment of participants to intervention and control groups will be conducted by an independent individual who is not involved in data collection, assessment, or analysis. The exercise packages will be pre-coded and distributed without labels indicating group allocation, ensuring that the identity of the intervention and control groups remains concealed. Outcome assessors will work only with coded data and will have no access to information about the type of exercises each group receives. Only the principal investigator responsible for designing the interventions will be aware of the specific exercises assigned to each group. However, this investigator will not participate in the data collection or analysis process to minimize the risk of bias.

Placebo
Not used

Assignment
Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee
Human Ethics Research Committee of the Sport Sciences Research Institute of Iran

Street address
No. 3, 5th Alley, Miremad Street, Motahhari Street, Tehran, Iran.

City
Tehran

Province
Tehran

Postal code
1587958711

Approval date
2024-11-05, 1403/08/15

Ethics committee reference number
IR.SSRC.REC.1403.072

Health conditions studied

1

Description of health condition studied
Ankle Pronation

ICD-10 code
M95.8

ICD-10 code description
Other acquired deformities of musculoskeletal system and connective tissue

Primary outcomes

1

Description
Balance and Ankle Proprioception

Timepoint
At the beginning of the study (before the start of the

intervention) and at the end of the study (6 weeks after the intervention)

Method of measurement

The Navicular Drop Test using Brody's method was performed to assess foot pronation, where a drop of more than 10 mm indicates pronation. In this method, the height of the navicular bone is measured in both a non-weight-bearing and a standing position, and the difference is recorded. Next, the Denis A Footprint Test was used to evaluate second-degree flatfoot. This test involves observing the footprint on a mirror box with the application of talcum powder for accuracy. Flatfoot is confirmed when the central and forefoot areas are of equal width, serving as the criterion for diagnosing the degree of flatfoot. Joint position sense: Joint position sense was measured through passive and active reconstruction of previous positions. Non-weight-bearing tests were conducted to assess proprioception in inversion and plantar flexion as these movements often exceed the normal ankle range. Angles of 10° and 30° for plantar flexion and 5° and 20° for inversion were tested. Participants sat on a table with their ankles fixed, and the gyroscope was calibrated to reduce measurement errors. After training, participants repeated the target angles three times, and the mean difference was recorded as an absolute error. The Y test was performed to assess dynamic balance. The participant stood barefoot at the center of a grid with lines extending in anterior, posteromedial, and posterolateral directions. While keeping one foot in the center, they used the other foot to reach along the lines with the big toe. The test was repeated three times in each direction, and the maximum reach distance was recorded as the raw score. The raw score was divided by the leg length and multiplied by 100 to normalize the data. The average maximum reach distances in all directions were calculated as a percentage. Leg length was measured from the anterior superior iliac spine to the medial malleolus in a supine position.

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group 2: The jump rope training protocol consisted of a six-week program, performed three days a week. Each session began with a 10-minute warm-up, including running and dynamic stretching. The exercises were performed at a speed of 120 jumps per minute using a metronome. The intervention included six types of jumps: basic jump, forward and backward double jump, double under, scissor jump, alternate jump, and one-jump-two-rope. Participants used standardized ropes weighing 230 grams, with the length adjusted individually. Rest intervals were 30 seconds between sets and 2 minutes between exercises. Each participant used their designated rope throughout the program.

Category

Rehabilitation

2

Description

Intervention group 2: The corrective exercise program was a six-week protocol with three 60-minute sessions per week, focusing on maintaining full-body alignment during exercises. The experimental group followed the program, while the control group continued their usual activities. The program consisted of an educational session and practical exercises. The educational session was a two-hour theoretical class on proper functional movements. The practical part included 21 exercises such as foam rolling for muscles (31 seconds), static stretching for gastrocnemius and soleus, eccentric strengthening of foot muscles, and dynamic exercises like the star balance test, stair climbing, and lunges. Each session included 11 minutes of warm-up, 11 minutes of inhibitory exercises, 35 minutes of stretching, strength, and integration exercises, and 5 minutes of cooldown. The program was conducted over 18 sessions, starting one day after the pre-test, while the control group continued their usual routines. The program was implemented at the Corrective Movement Center in Quchan during the 1403 academic year.

Category

Rehabilitation

3

Description

Control group: The control group continued their daily activities during this period without receiving any intervention. This group served as a baseline to compare the effects of the corrective exercises with the experimental group.

Category

Rehabilitation

Recruitment centers

1

Recruitment center

Name of recruitment center
Corrective Exercise clinic

Full name of responsible person
Karim Khalaghi

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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?
No
Title of funding source
Educational and Research Affairs, Hakim Nizami Qochan Institute of Higher Education
Proportion provided by this source
80
Public or private sector
Private
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
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Sharing plan

Deidentified Individual Participant Data Set (IPD)
Yes - There is 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
Yes - There is 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

Title and more details about the data/document
The data files will be available to researchers after the publication of the abstracted article

When the data will become available and for how long
After publication the article

To whom data/document is available
Other researchers

Under which criteria data/document could be used
There are no special conditions

From where data/document is obtainable
Corresponding Author: Please contact via email.

What processes are involved for a request to access data/document
Upon receiving a formal request for data or documentation, the process will involve review and approval by the corresponding author. Once the request is approved, the required data and documents will be prepared and provided to the requester within one week. This process includes thoroughly reviewing the request, preparing the data, and ensuring that the information provided aligns with the original request.

Comments