Clinical Trial Protocol
Iranian Registry of Clinical Trials

22 Nov 2026

Comparison of Eccentric and Concentric Shoulder Exercises on Pain, Range of Motion, and Electromyographic Activity of Selected Shoulder Muscles in Individuals with Shoulder Impingement Syndrome

Protocol summary

Study aim

Comparing the effects of concentric and eccentric exercises on pain, range of motion, and electromyographic activity of selected shoulder muscles in people with shoulder impingement syndrome

Design

A single-blind, randomized, parallel-group, controlled clinical trial on 45 patients. Randomization will be performed using the RAND function in Microsoft Excel.

Settings and conduct

This single-blind randomized controlled trial will be conducted at the Sports Laboratory of Kharazmi University with 45 male athletes aged 17-35 years diagnosed with shoulder impingement syndrome. Following screening and randomization into three groups, the intervention groups will complete an 8-week theraband training program (3 sessions/week), while the control group receives no intervention. Both participants and outcome assessors will remain blinded to group allocation throughout the study period.

Participants/Inclusion and exclusion criteria

Inclusion Criteria: Male athletes aged 17-35 years with shoulder impingement syndrome participating in overhead/throwing sports Shoulder pain persisting for ≥3 months No passive range of motion restriction indicating adhesive capsulitis ≥3 positive SIS diagnostic tests Exclusion Criteria: History of shoulder dislocation/fracture Cervical radiculopathy or spinal cord involvement signs Systemic diseases (e.g., diabetes) Previous shoulder/neck/thoracic surgery Steroid injections, physiotherapy or exercise therapy within 6 months Acromial deformities/morphological abnormalities

Intervention groups

Eccentric Exercise Group: Participants performed eccentric-only exercises using resistance bands (elastic therabands). Concentric Exercise Group: Participants performed concentric-only exercises using resistance bands (elastic therabands). Control Group: No exercise intervention was administered.

Main outcome variables

Pain (VAS) Electromyography (sEMG) Range of motion

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20180627040251N12**
Registration date: **2025-07-26, 1404/05/04**
Registration timing: **prospective**

Last update: **2025-07-26, 1404/05/04**
Update count: **0**

Registration date

2025-07-26, 1404/05/04

Registrant information

Name

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Name of organization / entity

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2025-08-01, 1404/05/10

Expected recruitment end date

2025-09-11, 1404/06/20

Actual recruitment start date
empty
Actual recruitment end date
empty
Trial completion date
empty

Scientific title
Comparison of Eccentric and Concentric Shoulder Exercises on Pain, Range of Motion, and Electromyographic Activity of Selected Shoulder Muscles in Individuals with Shoulder Impingement Syndrome

Public title
Comparison of Eccentric and Concentric Shoulder Exercises on Pain, Range of Motion, and Electromyographic Activity of Selected Shoulder Muscles in Individuals with Shoulder Impingement Syndrome
Purpose
Treatment
Inclusion/Exclusion criteria
Inclusion criteria:
Male athletes aged 17 to 35 with shoulder impingement syndrome, involved in overhead or throwing sports. Shoulder pain persisting for at least three months Absence of passive range of motion restriction indicating adhesive capsulitis Presence of at least 3 positive signs in SIS diagnostic tests (including: Neer test, Hawkins-Kennedy test, Jobe test, painful arc, and resisted external rotation test)
Exclusion criteria:
History of shoulder dislocation or fracture in either the affected or contralateral side Cervical radiculopathy or symptoms suggestive of spinal cord involvement Evidence of full-thickness rotator cuff tear (e.g., positive Drop Arm test or rotator cuff muscle strength of grade II or less on the Oxford scale) Systemic diseases (e.g., diabetes, etc.) Previous surgical interventions involving the shoulder, cervical spine, or chest area Positive Beighton & Horan test indicating ligamentous laxity Individuals who have received steroid injections, physiotherapy, or an exercise program within the past 6 months. Acromion deformities and abnormalities
Age
From **17 years** old to **35 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
Randomization was performed using a computer-generated random number table. Participants were assigned unique IDs from 1 to 45, and allocation to study groups was determined by sequentially matching these IDs with the random number sequence. This method ensured equal probability of assignment to each group.
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
Kharazmi University
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Shahid Keshvari Sports Complex, Kosha Street, between Shohareh and Hesari, Shahid Haghani Highway, Tehran (Mirdamad neighborhood)
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Approval date
2025-05-25, 1404/03/04
Ethics committee reference number
IR.KHU.REC.1404.050

Health conditions studied

1

Description of health condition studied
Shoulder Impingement Syndrome
ICD-10 code
ICD-10 code description

Primary outcomes

1

Description
Electromyographic activity: Electrical activity of the shoulder muscles is measured using surface electromyography (sEMG) with a Noraxon Wireless EMG device and includes the muscles of the shoulder area. Signals are recorded using bipolar surface electrodes according to the SENIAM protocol.

Timepoint
Outcome variables are measured at two time points: before the exercise protocol (pretest) and after the exercise protocol (posttest).

Method of measurement
Electromyographic activity: In this study, electrical activity of shoulder muscles will be measured by surface electromyography (sEMG) with the Noraxon Wireless EMG device. Muscle signals will be recorded at 90 degrees of abduction in the frontal, sagital, and scapular planes of motion. The muscles studied include the anterior deltoid, middle deltoid, posterior deltoid, supraspinatus, and infraspinatus. Signals will be recorded with bipolar surface electrodes according to the SENIAM protocol and with a distance of 2 cm between the electrodes.

Secondary outcomes

1

Description
Pain: Shoulder pain is measured using a visual analog scale (VAS) questionnaire.

Timepoint
Outcome variables are measured at two time points: before the exercise protocol (pretest) and after the exercise protocol (posttest).

Method of measurement
Pain: Pain in this study will be assessed using a visual analog scale (VAS).

2

Description
Range of motion: Active range of motion of the shoulder joint in flexion, abduction, internal rotation, and external rotation will be measured using an EA8161 goniometer manufactured by MSD.

Timepoint
Outcome variables are measured at two time points: before the exercise protocol (pretest) and after the exercise protocol (posttest).

Method of measurement
Range of motion: In this study, the active range of motion of the shoulder joint in the directions of flexion, abduction, internal rotation, and external rotation will be measured using a goniometer model EA8161 manufactured by MSD. The measurements will be repeated twice by placing the goniometer in standard anatomical positions and their average will be used for analysis. The range of motion will be recorded up to the maximum pain-free point.

Intervention groups

1

Description
First intervention group: Concentric exercise protocol: This protocol will be implemented for 6 weeks and in 18 sessions. Each movement will be performed in 3 sets with 10 repetitions. Monitoring of correct execution of the exercises will be done through weekly review by the examiner. After receiving general stretching exercises, they will perform concentric strengthening exercises for the rotator cuff muscles and around the shoulder. These exercises focus on shortening contraction of the muscles during movement against resistance. The movements include internal rotation of the shoulder, external rotation of the shoulder, and abduction at an angle of 90 degrees of the scapular plane, which will be performed using a resistance band (theraband) and in a sitting or standing position. Participants are required to perform the movements with a painless and controlled range. The intensity of the exercise is selected at a level where the participant can perform the movement with moderate resistance and 10 consecutive repetitions without pain. Each exercise will be performed in 3 sets of 10 repetitions with a 60-second rest between sets.

Category
Rehabilitation

2

Description
Second intervention group: Eccentric exercise protocol: This protocol will be implemented for 6 weeks and in 18 sessions. Each movement will be performed in 3 sets with 10 repetitions. Monitoring of correct execution of the exercises will be done through weekly checks by the examiner. After receiving general stretching exercises, the extroversion exercise group will enter the stretching resistance exercise program (eccentric). In these exercises, the three main movements including internal rotation of the shoulder, external rotation of the shoulder joint and abduction at an angle of 90 degrees in the scapular plane are performed using a resistance band (theraband) and in a controlled manner. Participants first perform the movement with the help of the examiner or actively and then in the return phase, they contract the muscle against the tension of the band and in a stretching (extroversion) manner. The main emphasis is on the slow and controlled execution of the eccentric phase (about 3 to 5 seconds). The intensity of the exercise is adjusted so that the individual can perform 10 consecutive repetitions without pain. Perform each exercise in 3 sets of 10 repetitions, with a 60-second rest between sets, for a total of 12 sessions (3 times a week for 6 weeks).

Category
Rehabilitation

3

Description
Control group: In the control group, no intervention will take place.

Category
N/A

Recruitment centers

1

Recruitment center

Name of recruitment center
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Full name of responsible person
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Sponsors / Funding sources

1

Sponsor

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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
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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Position
دانشجو تحصیلات تکمیلی

Latest degree
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Sport Medicine

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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