

Clinical Trial Protocol

Iranian Registry of Clinical Trials

11 Sep 2026

Comparison of the effects of eight weeks of neuromuscular, plyometric, and combined training on soccer performance and skills in adolescent male players with different levels of biological maturation and motor competence

Protocol summary

Study aim

Comparing the effects of eight weeks of neuromuscular, plyometric, and combined training on physical performance indicators (strength, speed, agility, explosive power, and endurance) and football technical skills (passing accuracy, shooting accuracy, dribbling, ball control, and decision-making) in adolescent male players aged 13-16 years with different levels of biological maturation and motor competence.

Design

Randomized controlled trial, single-blind (outcome assessors), parallel four-group, pre-test/post-test, sample size 60, software randomization, phase not applicable.

Settings and conduct

Study setting: Football academy. After screening and consent, 8-week intervention will be held in standard hall under expert trainer supervision. Blinding: Assessments by blinded assessors at pre-test and post-test.

Participants/Inclusion and exclusion criteria

Inclusion criteria: male adolescents 13-16 years; at least 2 years of football training; medical clearance; no injury in last 3 months; consent. Exclusion criteria: grade 2 or higher injury in last 6 months; uncontrolled chronic disease; use of steroids or growth hormones; concurrent participation in another training program.

Intervention groups

Intervention group 1 (Neuromuscular) : 8 weeks, 3×45-60min/week, balance, core stability, and motor control exercises. Intervention group 2 (Plyometric): 8 weeks, 3×45-60min/week, jumping and explosive exercises. Intervention group 3 (Combined): 8 weeks, 3×45-60min/week, combination of neuromuscular and plyometric training. Control group: no intervention.

Main outcome variables

Physical performance (lower body strength by vertical jump; speed by 20m sprint; agility by T-test; upper body

strength by bench press; aerobic endurance by Yo-Yo test; anaerobic power by RAST); football technical skills (passing accuracy, shooting accuracy, dribbling, ball control, and decision-making).

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20260624069940N8**

Registration date: **2026-09-09, 1405/06/18**

Registration timing: **prospective**

Last update: **2026-09-09, 1405/06/18**

Update count: **0**

Registration date

2026-09-09, 1405/06/18

Registrant information

Name

Atiye Gholizadeh

Name of organization / entity

Tarbiat modares university

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Recruitment status

Not yet recruiting

Funding source

Expected recruitment start date

2026-09-16, 1405/06/25

Expected recruitment end date

2026-11-11, 1405/08/20

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Comparison of the effects of eight weeks of neuromuscular, plyometric, and combined training on soccer performance and skills in adolescent male players with different levels of biological maturation and motor competence

Public title

Comparison of three training methods on soccer performance and skills in adolescent players

Purpose

Supportive

Inclusion/Exclusion criteria**Inclusion criteria:**

Male adolescents aged 13 to 16 years At least 2 years of regular football training in an academy or club Medical clearance from a sports physician No acute or chronic injury in the last 3 months Biological maturation within -2 to +2 years from Peak Height Velocity Motor competence at least at the 10th percentile of normal Written informed consent from both adolescent and parents No use of performance- or growth-affecting medications

Exclusion criteria:

History of grade 2 or higher acute lower limb injury in the last 6 months Uncontrolled chronic diseases Use of steroidal medications or growth hormones Concurrent participation in another training program outside the study

Age

From **13 years** old to **16 years** old

Gender

Male

Phase

N/A

Groups that have been masked

- Outcome assessor

Sample size

Target sample size: **60**

Randomization (investigator's opinion)

Randomized

Randomization description

After initial screening and confirmation of eligibility, the names of all eligible participants are recorded alphabetically in a preliminary list. Using the free online software Randomization.com (available at: www.randomization.com), a simple randomization sequence is generated with individual as the unit of randomization. The total number of participants (60) is entered into the software and the "Simple Randomization" option is selected. The software assigns each participant equally and randomly to one of four study groups (Neuromuscular, Plyometric, Combined,

and Control) using a random number-based algorithm. Since no stratification is used, all participants have an equal chance of being assigned to any of the four groups. The randomization sequence is printed as a table and placed into sealed, opaque, and numbered envelopes to ensure full allocation concealment. Each envelope is numbered externally and is opened only after completion of pre-test assessments by an independent person (not involved in the research process), in the order of the envelope numbers, and the participant is allocated to the corresponding group. This process is repeated for all 60 participants, with no possibility of interference or prediction in group allocation.

Blinding (investigator's opinion)

Single blinded

Blinding description

In this study, due to the nature of the exercise intervention, complete blinding is not possible. However, outcome assessors who are responsible for administering the performance and skill tests will be blinded to participants' group allocation. Participants, the principal investigator, and trainers are aware of the intervention type. Outcome assessors are blinded through participant coding and lack of access to group allocation information.

Placebo

Not used

Assignment

Parallel

Other design features

Randomized controlled trial, single-blind (outcome assessors), with four parallel groups and pre-test/post-test design

Secondary Ids

empty

Ethics committees**1****Ethics committee****Name of ethics committee**

Research Ethics Committee of Tarbiat Modares University

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Tarbiat Modares University, Shahid Chamran Blvd., Tehran, Iran

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Approval date

2026-07-18, 1405/04/27

Ethics committee reference number

IR.MODARES.REC.1405.121

Health conditions studied

1

Description of health condition studied

Soccer

ICD-10 code

Y93.66

ICD-10 code description

Activity, soccer (فعاليات، فووتبال)

Primary outcomes

1

Description

Lower Body Strength

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Vertical Jump Test using Vertec device or jump mat; measuring jump height in centimeters; each test repeated three times and the best result is recorded

2

Description

Sprint Speed

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

20-Meter Sprint Test using digital stopwatch or photocells; recording time in seconds; each test repeated twice and the best time is recorded

3

Description

Agility

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

T-Agility Test; recording completion time using digital stopwatch in seconds; each test repeated twice and the best time is recorded

4

Description

Upper Body Strength

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Bench Press Test with light to moderate barbell; recording maximum repeatable weight (one repetition maximum) in kilograms

5

Description

Aerobic Endurance

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Yo-Yo Intermittent Recovery Test Level 1; recording distance covered until exhaustion in meters

6

Description

Anaerobic Power

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Running-based Anaerobic Sprint Test (six 35-meter maximal sprints with 10 seconds rest); calculating peak power, mean power, and fatigue index

7

Description

Passing Accuracy

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Passing to designated targets from a standard distance; recording the number of accurate passes to the target out of total attempts (as a percentage)

8

Description

Shooting Accuracy

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Shooting to designated targets in four corners of the goal from a standard distance; recording the number of accurate shots to the target out of total attempts (as a percentage)

9

Description

Ball Control and Dribbling

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Dribbling Test in a zigzag course with designated obstacles; recording completion time using stopwatch in seconds

10

Description

Decision-Making in Game

Timepoint

Before the intervention and after 8 weeks of intervention

Method of measurement

Small-Sided Game Test; recording decision-making quality (correct pass, positioning, appropriate dribbling) by coaches using a standard performance analysis checklist

Secondary outcomes

empty

Intervention groups

1

Description

Intervention group 1 (Neuromuscular): Neuromuscular training for 8 weeks, three sessions per week, each session lasting 45 to 60 minutes. Each session includes 10 minutes of warm-up with light running and dynamic stretching, 30 to 40 minutes of specialized exercises including core stability, motor control, proprioception, balance, correction of basic movement patterns (squats, lunges, change of direction), and low to moderate intensity strength exercises (2 to 3 sets of 8 to 12 repetitions), and 5 to 10 minutes of cool-down with static stretching. Exercise intensity and difficulty will gradually increase over the 8 weeks.

Category

Behavior

2

Description

Intervention group 2 (Plyometric): Plyometric training for 8 weeks, three sessions per week, each session lasting 45 to 60 minutes. Each session includes 10 minutes of warm-up with light running and dynamic stretching, 30 to 40 minutes of specialized exercises including vertical jumps, horizontal jumps, single-leg hops, continuous bounding, reactive plyometrics, and explosive change of direction (2 to 3 sets of 6 to 10 repetitions) with gradual progressive overload, and 5 to 10 minutes of cool-down with static stretching. Special emphasis is placed on landing quality and motor control in all exercises.

Category

Behavior

3

Description

Intervention group 3 (Combined): Combined training (neuromuscular and plyometric) for 8 weeks, three sessions per week, each session lasting 45 to 60 minutes. Each session includes 10 minutes of warm-up with light running and dynamic stretching, 30 to 40 minutes of combined training including 20 to 25 minutes of neuromuscular exercises (core stability, motor control, balance, and movement pattern correction) and 15 to 20 minutes of plyometric exercises (vertical jumps, horizontal jumps, and explosive change of direction) with gradual progressive overload, and 5 to 10 minutes of cool-down with static stretching. The goal is to create integrated effects on neuromuscular control and explosive power.

Category

Behavior

4

Description

Control group: Participants in this group receive no structured training intervention outside their regular team training and are asked to continue their normal daily activities and football training throughout the 8-week study period. After the study completion, if the interventions prove effective, the beneficial training program will be offered to this group as well.

Category

Other

Recruitment centers

1

Recruitment center

Name of recruitment center

Tarbiat Modares University

Full name of responsible person

Alaa Al-shamilavi

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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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Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

Yes

Title of funding source

Tarbiat Modares 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**

Tarbiat Modares University

Full name of responsible person

Alaa Al-shamilavi

Position

PhD Candidate in Exercise Physiology

Latest degree

Master

Other areas of specialty/work

Exercise Physiology

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Person responsible for scientific inquiries**Contact****Name of organization / entity**

Tarbiat Modares University

Full name of responsible person

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Latest degree

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Other areas of specialty/work

Exercise Physiology

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

Tarbiat Modares University

Full name of responsible person

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Latest degree

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Other areas of specialty/work

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Sharing plan**Deidentified Individual Participant Data Set (IPD)**

Yes - There is a plan to make this available

Study Protocol

Yes - There is a plan to make this available

Statistical Analysis Plan

Yes - There is a plan to make this available

Informed Consent Form

Yes - There is a plan to make this available

Clinical Study Report

Yes - There is a plan to make this available

Analytic Code

No - There is not a plan to make this available

Data Dictionary

Yes - There is a plan to make this available

Title and more details about the data/document

De-identified individual participant data, study protocol, statistical analysis plan, informed consent form, clinical study report, and data dictionary: All collected data related to outcome variables (physical performance indicators and football technical skills) will be shared completely without identifying information.

Documentation regarding methodology, forms used, and analysis plan will also be provided.

When the data will become available and for how long

Six months after publication of study results

To whom data/document is available

Researchers affiliated with reputable academic and scientific institutions who have an approved research proposal by their institutional ethics committee.

Under which criteria data/document could be used

Data may be used solely for research purposes and secondary analyses related to exercise physiology and sports performance. Commercial use of the data is not permitted. All users must adhere to ethical requirements and maintain data confidentiality, and must report any findings from their analyses to the primary authors. Requests must include a detailed description of the project and its objectives.

From where data/document is obtainable

To request data, please contact the corresponding author, Mr. Alaa Al-shamilavi, via email at Al-

shamilavi@modares.ac.ir. Requests may also be submitted through the Department of Exercise Sciences at Tarbiat Modares University.

What processes are involved for a request to access data/document

Upon submission of a request via email, the corresponding author will review the application. After approval by the university ethics committee, the request will be forwarded to the research team. If finally approved, de-identified data will be provided within two to four weeks via email or a secure data-sharing platform.

Comments

Data will be provided solely for non-commercial purposes, with full adherence to ethical principles and confidentiality of participant information.