# Clinical Trial Protocol
# Iranian Registry of Clinical Trials

22 Nov 2026

## Effects of High-Intensity Endurance Training on Erythropoietin (EPO), Albumin, and Total Bilirubin Levels in Amateur Athletes

## Protocol summary


**Study aim**

To investigate the effects of 12-week high-intensity endurance training on erythropoietin (EPO), albumin, and bilirubin levels in amateur university athletes.

**Design**

This study was a randomized, parallel-group controlled trial with a pretest–posttest design. Twenty male amateur university athletes were randomly allocated to an experimental group (n = 10) receiving 12 weeks of high-intensity endurance training or a control group (n = 10). EPO, albumin, and bilirubin levels were assessed before and after the intervention.

**Settings and conduct**

The study was conducted at the University of the Punjab, Lahore, Pakistan. Twenty male amateur athletes were randomly assigned to experimental and control groups. The experimental group completed 12 weeks of high-intensity endurance training. Blood samples were collected before and after the intervention to measure serum EPO, albumin, and total bilirubin levels.

**Participants/Inclusion and exclusion criteria**

Male amateur university athletes aged 18–25 years with at least 6 months of exercise experience and written informed consent were included. Participants with chronic diseases or using medications or antioxidant supplements that could affect the study outcomes were excluded.

**Intervention groups**

Experimental Group (n = 10): Participants completed a 12-week high-intensity endurance training program. Control Group (n = 10): Participants did not receive the prescribed training intervention and continued their usual activities.

**Main outcome variables**

The primary outcome measures were changes in serum erythropoietin (EPO) concentration, serum albumin level, and serum total bilirubin level from baseline to post-intervention after 12 weeks of high-intensity endurance training.


## General information

**Reason for update**

**Acronym**

**IRCT registration information**

IRCT registration number: **IRCT20261015071440N1**
Registration date: **2026-10-19, 1405/07/27**
Registration timing: **prospective**

Last update: **2026-10-19, 1405/07/27**
Update count: **0**

**Registration date**

2026-10-19, 1405/07/27


**Registrant information**

**Name**
alamgir khan
**Name of organization / entity**
University of the Punjab
**Country**
Pakistan
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**Recruitment status**

**Recruitment complete**

**Funding source**

**Expected recruitment start date**

2026-10-22, 1405/07/30

**Expected recruitment end date**

2026-11-01, 1405/08/10

**Actual recruitment start date**

empty

**Actual recruitment end date**

empty

**Trial completion date**

empty

**Scientific title**
Effects of High-Intensity Endurance Training on Erythropoietin (EPO), Albumin, and Total Bilirubin Levels in Amateur Athletes

**Public title**
Effects of High-Intensity Endurance Training on Selected Blood Markers in Amateur Athletes

**Purpose**
Other

**Inclusion/Exclusion criteria**

**Inclusion criteria:**
minimum exercise background of 6–12 months , no chronic diseases, no current medication no antioxidant supplementation,

**Exclusion criteria:**
Participants with a history of chronic diseases or medical conditions that could affect their ability to safely . participate in high-intensity endurance training.2.Participants currently taking medications or using antioxidant supplements that could influence the study outcomes

**Age**
From **18 years** old to **25 years** old

**Gender**
Male

**Phase**
N/A

**Groups that have been masked**
*No information*

**Sample size**
Target sample size: **20**

**Randomization (investigator's opinion)**
Randomized

**Randomization description**
After eligibility screening and obtaining written informed consent, the 20 eligible participants were randomly assigned in a 1:1 ratio to either the experimental group (n = 10) or the control group (n = 10). Randomization was performed using Microsoft Excel to generate a computer-based random allocation sequence.

**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**
Ethical Committee, Department of Sports Sciences and Physical Education, University of the Punjab, L

**Street address**
Quaid-e-Azam Campus

**City**
Lahore

**Postal code**
54590

**Approval date**
2026-06-22, 1405/04/01

**Ethics committee reference number**
SPS-751

## Health conditions studied

### 1

**Description of health condition studied**
Exercise-Induced Physiological Responses in Healthy Amateur Athletes

**ICD-10 code**

**ICD-10 code description**

## Primary outcomes

### 1

**Description**
Changes in serum erythropoietin (EPO) concentration, serum albumin, and total bilirubin levels from baseline to after 12 weeks of high-intensity endurance training.

**Timepoint**
At baseline (before the intervention) and after 12 weeks of training (24 hours after the final training session).

**Method of measurement**
Venous blood samples were collected after overnight fasting. Serum EPO was measured using the ELISA method, albumin by the bromocresol green (BCG) colorimetric method, and total bilirubin using the Jendrassik–Grof/Diazo method. Measurements were performed before and after the 12-week intervention.

## Secondary outcomes

### 1

**Description**
No secondary outcome variables were specified.

**Timepoint**
No secondary outcome variables were specified.

**Method of measurement**
No secondary outcome variables were specified.

## Intervention groups

### 1

**Description**
Intervention group: (n = 10): Participants performed high-intensity endurance training for 12 weeks, with sessions lasting 60–75 minutes at 75–90% of maximum heart rate.

**Category**

N/A

**2**

**Description**
Control group: (n = 10): Participants continued their usual daily activities without receiving the prescribed endurance training intervention.
**Category**
N/A

## Recruitment centers

**1**

**Recruitment center**
**Name of recruitment center**
Department of Sports Sciences and Physical Education, University of the Punjab, Lahore, Punjab, Paki
**Full name of responsible person**
alamgir khan
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Quaid-e-Azam Campus
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## Sponsors / Funding sources

**1**

**Sponsor**
**Name of organization / entity**
Self Funding
**Full name of responsible person**
Manzoor khan
**Street address**
Department of sports sciences and physical education University of the Punjab
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**Email**
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**Web page address**
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**Grant name**
Manzoor khan
**Grant code / Reference number**
**Is the source of funding the same sponsor organization/entity?**
Yes
**Title of funding source**
Self Funding
**Proportion provided by this source**
100
**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**
**Name of organization / entity**
University of the Punjab
**Full name of responsible person**
Manzoor khan
**Position**
Punjab
**Latest degree**
Ph.D.
**Other areas of specialty/work**
Exercise physiology
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## Person responsible for scientific inquiries

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## Person responsible for updating data

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**Other areas of specialty/work**
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**Web page address**
https://pu.edu.pk/

## 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**
Yes - There is 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**
Effects of High-Intensity Endurance Training on Hematological Markers (EPO, Albumin, Total Bilirubin) in Amateur Athletes. Details: An experimental study investigating the 12-week impact of high-intensity endurance training on serum Erythropoietin (EPO), albumin, and total bilirubin concentrations among 20 male amateur student-athletes (divided into an experimental group and a control group) at the University of the Punjab, Lahore, Pakistan

**When the data will become available and for how long**
The data becomes available upon the publication/registration of the study and will remain accessible as part of the permanent research record

**To whom data/document is available**
Available to researchers, scientific reviewers, and the public/scientific community through institutional and publication platforms.

**Under which criteria data/document could be used**
Can be used for academic research, evidence-based sports science insights, systematic reviews, and meta-analyses, provided proper citation of the source study is maintained.

**From where data/document is obtainable**
Obtainable from the Department of Sports Sciences and Physical Education, University of the Punjab, Lahore, Pakistan, or via the corresponding author (Alamgir Khan, Email: alamgir.sspe@pu.edu.pk).

**What processes are involved for a request to access data/document**
Requests for raw data or additional documentation can be made by contacting the corresponding author via email, subject to institutional ethical guidelines and data sharing policies

**Comments**
The study protocol received ethical approval from the Departmental Ethical Committee of the Department of Sports Sciences and Physical Education, University of the Punjab, Lahore, Pakistan (Approval Reference: SPS-751)