

Prediction of anterior cruciate ligament injury in basketball players using machine learning

Submission date 22/08/2024	Recruitment status No longer recruiting	<input type="checkbox"/> Prospectively registered
		<input type="checkbox"/> Protocol
Registration date 22/08/2024	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan
		<input checked="" type="checkbox"/> Results
Last Edited 21/10/2025	Condition category Musculoskeletal Diseases	<input type="checkbox"/> Individual participant data

Plain English summary of protocol

Background and study aims

This study aims to find out what factors increase the risk of ACL (anterior cruciate ligament) injuries in young adult basketball players. The ACL is a crucial ligament in the knee, and injuries to it can be serious and often require surgery. The researchers also want to see if machine learning, a type of computer technology, can accurately predict who might get injured. By doing this, they hope to identify important risk factors specific to male basketball players, which could help in creating better injury prevention strategies.

Who can participate?

To participate in this study, you must be:

1. Male
2. At least 18 years old
3. Exercising at least 8 hours per week
4. Playing basketball for at least 3 years
5. Not having a knee injury based on a specific test called the Lachman's test

What does the study involve?

If you join the study, you will undergo several tests to measure factors related to ACL injuries. After the tests, you will be followed for 12 months to see if you sustain an ACL injury during that time. Your data will help in developing and validating a machine learning model to predict ACL injuries in basketball players.

What are the possible benefits and risks of participating?

By participating, you could help advance understanding of ACL injuries in basketball players and contribute to better injury prevention strategies in the future. There may be minimal risks associated with the physical tests, but these will be conducted by trained professionals to ensure your safety.

Where is the study run from?

The study is being conducted at Hospital Universiti Sains Malaysia

When is the study starting and how long is it expected to run for?
October 2021 to April 2024

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Guo-Long-fei (guolongfei0422@student.usm.my)
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Contact information

Type(s)

Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)

Nil known

ClinicalTrials.gov (NCT)

Nil known

Protocol serial number

USM/JEPeM/22040199

Study information

Scientific Title

Prediction of anterior cruciate ligament (ACL) injuries in basketball players using machine learning algorithms: a prospective study

Acronym

B-ACL-ML

Study objectives

1. Athlete's profile, Physical function, basketball-specific skills, biomechanics and electromyography are related to ACL injury risk among basketball athletes.
2. The predictive model is valid in distinguishing between male basketball players with and without ACL injuries.

Ethics approval required

Ethics approval required

Ethics approval(s)

approved 01/09/2022, Jawatankuasa Etika Penyelidikan Manusia Universiti Sains Malaysia (Universiti Sains Malaysia 16150 Kubang Kerian, Kelantan., Kelantan, 15000, Malaysia; +60 9-7673000; jepem@usm.my), ref: USM/JEPeM/22040199

Study design

Single-center observational cohort study

Primary study design

Observational

Study type(s)

Diagnostic, Prevention, Screening, Efficacy

Health condition(s) or problem(s) studied

Prevention of anterior cruciate ligament (ACL) injury in male basketball players

Interventions

In this study, 104 young adult basketball players volunteer to participate. The athletes' profiles, physical functions, basketball-specific skills, biomechanics, and electromyography (EMG) of seven muscles, including the quadriceps, hamstrings, and gastrocnemius, are measured during unanticipated side-cutting maneuvers. After a 12-month follow-up, these data will be compared between those who sustain injuries and those who remain injury-free.

Intervention Type

Behavioural

Primary outcome(s)

Measured at baseline and 12 months:

1. The athlete's profile (height, weight, age, level of play, playing position), basketball training record, and self-reported injury history for each participant were recorded
2. Balance testing and joint mobility testing were conducted using YBT and FMS, with a duration of half an hour
3. Biomechanical and synchronized electromyography (EMG) experiments were performed, lasting for two hours
4. Trunk testing was conducted using DLH, strength testing was performed with 1-RM weighted squat and deadlift, explosive strength was assessed using countermovement jump (CMJ), squat jump (SJ), and drop jump (DJ), and agility testing was carried out with the Lane Agility Test lasting for two hours

Key secondary outcome(s)

There are no secondary outcome measures

Completion date

03/04/2024

Eligibility

Key inclusion criteria

1. Male
2. Age over 18 years
3. Exercising ≥ 8 hours per week,
4. Having played basketball for at least 3 years
5. Having a negative Lachman's knee examination

Participant type(s)

Healthy volunteer

Healthy volunteers allowed

No

Age group

Adult

Lower age limit

18 years

Upper age limit

30 years

Sex

Male

Total final enrolment

114

Key exclusion criteria

1. Exercise-related or neurological disorders
2. Recent hip or knee surgery or trauma
3. Incomplete data not being analyzed

Date of first enrolment

02/09/2022

Date of final enrolment

04/04/2023

Locations

Countries of recruitment

China

Study participating centre

Taiyuan University of Technology High Performance Sports Centre

No.18, Xinminyuan Road, Wanbailin District

Taiyuan

China

030024

Study participating centre

Xinzhou Normal University

No.1, Dunqi East Street

Xinzhou

China

034000

Sponsor information

Organisation

Hospital Universiti Sains Malaysia

ROR

<https://ror.org/0090j2029>

Funder(s)

Funder type

Other

Funder Name

Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan

Individual participant data will not be provided due to privacy concerns

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		14/10/2025	21/10/2025	Yes	No