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

Submission date
22/08/2024

Recruitment status
No longer recruiting

Registration date
22/08/2024

Overall study status
Completed

Last Edited
21/10/2025

Condition category
Musculoskeletal Diseases

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] 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

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

Primary study design
Observational

Study design
Single-center observational cohort study

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
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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