

Effects of unilateral and bilateral complex training on lower-limb asymmetry and sprint performance in male sprinters

Submission date 07/07/2026	Recruitment status No longer recruiting	☐ Prospectively registered ☐ Protocol
Registration date 15/07/2026	Overall study status Completed	☐ Statistical analysis plan ☐ Results
Last Edited 14/07/2026	Condition category Other	☐ Individual participant data ☒ Record updated in last year

Plain English summary of protocol

Background and study aims

Many sprinters develop strength differences between their left and right legs. These differences may affect movement efficiency and sprint performance.

Who can participate?

Male collegiate sprinters with lower-limb asymmetry.

What does the study involve?

Participants are randomly assigned to one of two training programs. Both groups continue normal sprint training while completing supervised complex training twice each week for 10 weeks. Physical performance is measured before and after training.

What are the possible benefits and risks of participating?

The intervention may improve lower-limb symmetry, strength, and sprint performance. Risks are similar to routine resistance and plyometric training, including temporary muscle soreness and minor sports injuries.

Where is the study run from?

Guangzhou Sport University, China.

When is the study starting and how long is it expected to run for?

March 2024 to April 2025.

Who is funding the study?

Guangzhou Sport University, China.

Who is the main contact?

Changsheng Lyu, lvcs@gzsport.edu.cn.

Contact information

Type(s)

Principal investigator, Public, Scientific

Contact name

Mr Lyu Changsheng

ORCID ID

<https://orcid.org/0009-0002-7721-0914>

Contact details

Guangzhou Sport University, No. 1268 Guangzhou Avenue

Guangzhou City, Guangdong Province

China

510010

+86 15915765187

lvcs@gzsport.edu.cn

Additional identifiers

Study information

Scientific Title

A parallel-group randomized controlled trial comparing unilateral-emphasized complex training versus bilateral complex training for reducing lower-limb functional asymmetry and improving sprint performance in male sprinters with baseline interlimb asymmetry

Study objectives

To compare the effects of unilateral-emphasized complex training and bilateral complex training on lower-limb functional asymmetry.

To compare changes in lower-limb strength, explosive performance, balance, functional movement, and sprint performance.

To determine whether improvements in asymmetry are associated with improvements in sprint performance.

Ethics approval required

Ethics approval required

Ethics approval(s)

Approved 08/03/2024, Human Experimental Ethics Inspection Committee of Guangzhou Sport University (Guangzhou Sport University, No. 1268 Guangzhou Avenue Middle, Tianhe District, Guangzhou City, Guangdong Province, 510500, China; +86 020 38025032; gztykjc@163.com), ref: 2024LCLL-20

Primary study design

Interventional

Allocation

Randomized controlled trial

Masking

Open (masking not used)

Control

Active

Assignment

Parallel

Purpose

Treatment

Study type(s)**Health condition(s) or problem(s) studied**

Lower-limb functional asymmetry in competitive male sprinters

Interventions

Participants are randomly allocated (1:1) to unilateral-emphasized complex training (UCT) or bilateral complex training (BCT). Randomization is generated using a computer-generated random-number table.

Both groups continue their regular sprint training and complete supervised complex training twice weekly for 10 weeks. The UCT group performs unilateral resistance and plyometric exercises with a 3:1 training-volume allocation favoring the non-dominant limb, whereas the BCT group performs conventional bilateral complex training with matched total training volume. Outcome measures are assessed before and after the intervention, including isokinetic knee strength, maximal strength, jump performance, balance, functional movement, sprint performance, sprint kinematics, and interlimb asymmetry indices.

Intervention Type

Behavioural

Primary outcome(s)

1. Interlimb asymmetry of knee extensor peak torque measured using isokinetic dynamometry and the Asymmetry Index (AI) at baseline and week 12
2. Knee flexor asymmetry index measured using isokinetic dynamometry at baseline and week 12

Key secondary outcome(s)

1. 100-m sprint performance measured using a 100-m sprint test at baseline and week 12
2. One-repetition maximum (1RM) measured using standard 1RM testing at baseline and week 12
3. Lower-body explosive power measured using a Countermovement Jump (CMJ) test at baseline and week 12
4. Single-leg jump asymmetry measured using a unilateral jump testing at baseline and week 12
5. Y-Balance performance measured using a Y-Balance Test at baseline and week 12

6. Movement asymmetries measured using a Functional Movement Screen (FMS) at baseline and week 12

7. Sprint kinematics measured using two-dimensional motion analysis at baseline and week 12

Completion date

01/04/2025

Eligibility

Key inclusion criteria

1. Male sprinters
2. At least 3 years of systematic sprint training
3. Training frequency ≥ 4 sessions per week
4. 100-m performance meeting the Chinese National Second-Class Athlete standard
5. Baseline lower-limb functional asymmetry (ASL $>10\%$)
6. No lower-limb injury within the previous 3 months

Healthy volunteers allowed

No

Age group

Adult

Lower age limit

18 Years

Upper age limit

30 Years

Sex

Male

Total final enrolment

14

Key exclusion criteria

1. Unable to complete the intervention
2. Unable to complete outcome assessment
3. Acute injury during the intervention affecting training or testing

Date of first enrolment

10/03/2024

Date of final enrolment

01/04/2025

Locations

Countries of recruitment

China

Study participating centre

Guangzhou Sport University

Guangzhou Sport University, No. 1268 Guangzhou Avenue, Guangzhou City, Guangdong Province
Guangzhou
China

Sponsor information

Organisation

Guangzhou Sport University

ROR

<https://ror.org/046r6pk12>

Funder(s)

Funder type

Funder Name

Guangzhou Sport University

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Not expected to be made available