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Extended reality-based feedback training for improving sprint technique in track athletes

Submission date
19/06/2026

Recruitment status
No longer recruiting

Registration date
19/06/2026

Overall study status
Completed

Last Edited
19/06/2026

Condition category
Other

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Sprint performance depends on small differences in running technique, force application, and movement coordination. Coaches often use verbal instructions or video feedback to help athletes improve their technique, but this feedback is usually delayed and may not allow athletes to correct their movements immediately. Extended reality (XR) technology may allow athletes to receive real-time visual, vibration-based, and sound-based feedback during training. This study aims to assess whether an XR-based multisensory feedback training system can improve sprint technique and sprint performance in healthy national-level track athletes compared with video feedback or conventional sprint training.

Who can participate?
Healthy national-level track and field sprint athletes aged 18 to 25 years

What does the study involve?
Thirty sprinters are randomly assigned to one of three groups: an XR-based multisensory feedback group, a video feedback group, or a conventional training control group. All groups complete a 12-week sprint training programme with three 60-minute sessions per week, followed by a 4-week retention assessment period. The XR feedback group receives real-time feedback using an XR headset, a vibration belt, and sound cues during part of each training session. The video feedback group receives delayed video playback and verbal technical feedback. The control group continues conventional sprint training with general coaching encouragement. Sprint performance, movement technique, force production, muscle coordination, brain activity measures, and perceived workload are assessed at different timepoints during the study.

What are the possible benefits and risks of participating?
Participants may benefit from structured sprint training and feedback that could help improve their sprint technique and performance. The possible risks are similar to those associated with normal sprint training, such as muscle soreness, fatigue, falls, or musculoskeletal injury. Additional minor risks may include discomfort from wearing the XR headset, sensors,

headphones, or vibration belt. To reduce these risks, participants are screened before taking part, training sessions are supervised, feedback trials are performed at submaximal intensity where appropriate, and participants can stop taking part at any time.

Where is the study run from?
Chizhou University (China)

When is the study starting and how long is it expected to run for?
April 2025 to August 2025

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Dr Gang Qin, qingang@hanyang.ac.kr

Contact information

Type(s)
Scientific, Public, Principal investigator

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Study information

Scientific Title
An extended reality-based multisensory feedback system for real-time sprint technique optimization in track athletes: a randomized controlled trial

Acronym
XR-Sprint

Study objectives

The objective of this study was to evaluate whether a 12-week extended reality (XR)-based multisensory feedback training intervention improves sprint performance, biomechanical efficiency, neuromuscular coordination, and neural efficiency in healthy national-level sprinters compared with video-based feedback and conventional training.

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 18/04/2025, Ethics Committee of the School of Physical Education, Chizhou University (School of Physical Education, Chizhou University, No. 199 Muzhi Road, Guichi District, Chizhou, 247000, China; +86 (0)566 274 8895; zsb@czu.edu.cn), ref: CZ20250411

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Active

Assignment
Parallel

Purpose
Treatment

Study type(s)

Health condition(s) or problem(s) studied
Sprint technique optimization, sprint performance enhancement, and neuromuscular coordination in healthy national-level sprinters

Interventions
Participants were randomly assigned to one of three parallel groups: an XR-based multisensory feedback group, a video feedback group, or a conventional training control group. Randomisation was performed using a computer-generated random sequence and was stratified by sex to ensure balanced allocation of male and female athletes across the three groups.

All groups completed a 12-week sprint training programme with three 60-minute sessions per week, followed by a 4-week retention period. The XR-based feedback group received 20 minutes per session of real-time multisensory feedback using an XR head-mounted display, vibrotactile belt, and auditory rhythm cues, in addition to 40 minutes of conventional sprint training. The video feedback group received 20 minutes per session of delayed video playback and verbal technical feedback, in addition to 40 minutes of conventional sprint training. The control group completed 60 minutes per session of conventional sprint training with general coaching

encouragement only. Training volume, sprint intensity, number of trials, and rest intervals were matched across groups.

Intervention Type
Behavioural

Primary outcome(s)
1. 30-m sprint time measured using a Brower TC-Gates photocell timing system placed at 0, 10, 20 and 30 m, at baseline, week 6, week 12, and week 16 retention assessment

Key secondary outcome(s)

Completion date
10/08/2025

Eligibility

Key inclusion criteria
1. National-level track and field sprint athletes aged 18–25 years
2. At least 3 years of systematic sprint training experience
3. Normal or corrected-to-normal vision and hearing
4. No history of neurological disorders or vestibular dysfunction
5. No musculoskeletal injuries within the preceding 6 months

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
18 years

Upper age limit
25 years

Sex
All

Total final enrolment
30

Key exclusion criteria
1. Contraindications to wearing head-mounted devices
2. Unable to complete the full 16-week study protocol
3. History of neurological disorders or vestibular dysfunction
4. Musculoskeletal injuries within the preceding 6 months
5. Uncorrected vision or hearing problems

Date of first enrolment

20/04/2025

Date of final enrolment
30/04/2025

Locations

Countries of recruitment
China

Sponsor information

Organisation
Kangwon National University

ROR
https://ror.org/01mh5ph17

Funder(s)

Funder type

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available