

Study Protocol

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Comparing the Effects of Small-Sided Basketball Games and Running-Based High-Intensity Interval Training on Physical Fitness and Body Composition in Untrained Young Adults: A Randomized Controlled Trial

Short public title	An eight-week study comparing recreational basketball games and interval running to improve fitness and body composition in inactive young adults
Design	Three-arm parallel RCT (1:1:1); assessor-blinded outcomes
Participants	Untrained young adults, 18-22 years; target N=90 (30 per group)
Intervention	8 weeks; 3 sessions/week; supervised; standardized warm-up
Ethics approval	Academic Affairs Office of Hunan Mechanical & Electrical Polytechnic; Approval No. 20250710; Approved 10 July 2025
Planned dates	July 2025 to November 2025 (first enrolment: 10 July 2025)

1. Background and rationale

Insufficient physical activity in young adults is associated with low cardiorespiratory fitness and unfavorable body composition. Time-efficient exercise strategies, including small-sided games and high-intensity interval training, may improve multiple fitness domains. This trial compares an 8-week basketball small-sided games program with running-based HIIT and a non-training control condition.

2. Objectives

- 1 Compare pre-post changes in fitness and body composition across SSG, HIIT, and control.
- 2 Test whether SSG produces improvements comparable to HIIT.

3. Design

Parallel-group RCT with three arms and two timepoints (baseline Week 0; post Week 8). Allocation ratio 1:1:1.

4. Participants

Inclusion: age 18-22; sedentary/untrained; cleared for vigorous exercise; able to attend sessions and tests; written consent.

Exclusion: unsafe medical condition; current sports injury; ongoing treatment interfering with participation; physically active ≥ 90 min/week; inability to comply or complete assessments.

5. Randomization and blinding

Computer-generated randomization stratified by sex. Allocation concealment via sealed, opaque, sequentially numbered envelopes prepared by a third party. Outcome assessors are blinded; participants and trainers are not blinded.

6. Interventions

Frequency: 3 sessions/week for 8 weeks. Each session begins with a standardized 15-min warm-up (5 min moderate running, 5 min dynamic stretching, 5 min reaction drills) followed by 16 min of main training.

Basketball small-sided games (SSG)

Three sessions per week for 8 weeks. Each session: 15-min standardized warm-up, then 16 min of effective game play using either (a) 3 v 3 on a 12 x 15 m court (4 x 4 min bouts, 3-min passive rests) or (b) 5 v 5 on a 20 x 15 m court (2 x 8 min bouts, 5-min passive rest). Standard balls and spare balls were used for rapid restarts; a 20-s shot clock was applied; coaches provided only general encouragement and player rotation.

Running-based HIIT

Three sessions per week for 8 weeks. Each session: 15-min standardized warm-up, then running intervals on an outdoor synthetic track at approximately 80-85% HRmax using either (a) 30 s hard run + 30 s jog recovery (30-30) or (b) 40 s hard run + 20 s jog recovery (40-20). Both protocols: 4 sets x 4 repetitions, with 3-min passive rest between sets; total effective work time 16 min.

Control (no structured training)

No structured training intervention during the 8-week period; participants were asked to maintain their usual lifestyle and physical activity habits.

7. Monitoring and adherence

- Heart rate monitored during sessions (telemetry).
- Session RPE (Borg CR10) recorded about 20 min post-session.
- Target adherence for intervention arms: $\geq 85\%$ of sessions.

8. Outcomes and timepoints

Timepoints: baseline (Week 0) and post-intervention (Week 8). Outcomes include:

- Body mass (kg) - SECA 760 scale (0.1 kg).
- Body mass index (kg/m^2) - Calculated from body mass and height; height by SECA 213 stadiometer (0.1 cm).
- Handgrip strength - left/right (kg) - Electronic dynamometer (TKK 5101). Best of 3 maximal trials after familiarization.
- Standing long jump distance (m) - Best of 2 trials after 1 practice.
- Vertical jump height (cm) - My Jump 2 app from iPhone slow-motion video; best of 2 trials after 1 practice.
- Sprint time (10 m and 30 m; s) - Infrared timing system; best of 2 trials.
- Change-of-direction (5-0-5 test time; s) - Infrared timing; fastest valid trial.
- Aerobic endurance (20 m multistage fitness test distance; m) - Leger 20-m shuttle run; total distance.

9. Sample size

Power analysis indicated a minimum of 66 participants; target $N=90$ (30 per group) to allow for attrition.

10. Ethics and dissemination

Approved by Academic Affairs Office of Hunan Mechanical & Electrical Polytechnic (Approval No. 20250710). Results will be disseminated via peer-reviewed publication. This protocol is posted as a transparency document

and is not peer-reviewed.

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