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Sports dance training and brain development in teenagers: a study using brain imaging

Submission date 23/11/2026	**Recruitment status** No longer recruiting	[_] Prospectively registered [_] Protocol [_] Statistical analysis plan [_] Results [_] Individual participant data [X] Record updated in last year
Registration date 27/11/2026	**Overall study status** Completed	
Last Edited 27/11/2026	**Condition category** Other	

Plain English summary of protocol

Background and study aims

The teenage years are an important period for brain development. This study tested whether regular sports dance training improves teenagers' executive functions (such as memory and self-control), their social and emotional skills, and the activity of the front part of the brain, measured with a safe, non-invasive light-based brain imaging technique called functional near-infrared spectroscopy (fNIRS).

Who can participate?

Healthy teenagers aged 13 to 16 years with no previous formal dance training.

What does the study involve?

Participants are randomly allocated to one of three groups: high-intensity dance training, moderate-intensity dance training, or regular school physical education. All groups attend 60-minute sessions three times a week for 24 weeks. Brain activity, thinking skills, social-emotional skills and fitness are measured before, during and after the programme, and again 12 weeks later.

What are the possible benefits and risks of participating?

Participants may improve their fitness and thinking skills. The risks are minimal and similar to normal school sports; brain imaging with fNIRS is non-invasive and painless.

Where is the study run from?

Three public middle schools in Beijing, China.

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

September 2024 to July 2025

Who is funding the study?

Investigator initiated and funded

Who is the main contact?

Dr Hanshi Wang, Duyao99888@163.com

Contact information

Type(s)
Public, Scientific, Principal investigator

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Study information

Scientific Title
Effects of sports dance training on adolescent brain executive function and social-emotional development: a three-arm assessor-blinded randomized controlled trial based on fNIRS brain functional imaging

Study objectives
To determine whether 24 weeks of structured sports dance training at high (70–85% HRmax) versus moderate (55–70% HRmax) intensity improves executive function, social-emotional competence, and task-evoked prefrontal cortex activation (fNIRS) in adolescents aged 13–16 years, compared with standard school physical education; and to examine whether neural changes mediate behavioural improvements.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 21/06/2024, Beijing Health School Research Ethics Committee (No. 10 Xitoutiao, You'anmenwai, Fengtai District, Beijing, 100069, China; +86 (0)13437887967; bhsirb@163.com), ref: BHSREC-2024-0387

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Active

Assignment
Parallel

Purpose
Prevention

Study type(s)

Health condition(s) or problem(s) studied
Executive function and social-emotional development in healthy adolescents

Interventions
Participants (n = 180) were randomly allocated to the high-intensity dance training group, the moderate-intensity dance training group, or the control group (60 participants per group) using a random number table generated with SPSS statistical software (IBM Corp., Armonk, NY, USA).

Arm 1:
High-intensity dance training (HIDT; n = 60): structured sports dance, 60 min/session, three sessions/week for 24 weeks, at 70–85% of age-predicted maximum heart rate (HRmax = 208 – 0.7 × age), monitored with Polar H10 sensors. Each session: warm-up (10 min), skill acquisition (20 min), practice consolidation (20 min), cool-down with feedback (10 min). Curriculum progressed through three 8-week phases of increasing choreographic and cognitive complexity.

Arm 2:
Moderate-intensity dance training (MIDT; n = 60): identical structure and curriculum, at 55–70% HRmax.

Arm 3:
Active comparator (CON; n = 60): standard school physical-education activities (basketball, volleyball, jogging), matched for session frequency (3×/week) and duration (60 min), 24 weeks.

All groups:
12-week no-intervention follow-up. Assessments at baseline (T0), 8 weeks (T1), 16 weeks (T2), post-intervention 24 weeks (T3), and follow-up 36 weeks (T4).

Intervention Type
Behavioural

Primary outcome(s)
1. Dorsolateral prefrontal cortex (dlPFC) oxyhemoglobin (HbO) response during the n-back working-memory task measured using 64-channel functional near-infrared spectroscopy (fNIRS; NIRScout, NIRx Medical Technologies; 760/850 nm); change in task-evoked HbO concentration at baseline (T0) and post-intervention at 24 weeks (T3)

Key secondary outcome(s)

Completion date
29/07/2025

Eligibility

Key inclusion criteria
1. Aged 13–16 years
2. Right-handed (Edinburgh Handedness Inventory score > +40)
3. Normal or corrected-to-normal vision
4. No prior formal dance training (<6 months lifetime experience)
5. Able to participate in moderate-to-vigorous physical activity without restrictions
6. Written informed consent from legal guardians and written assent from adolescent participants

Healthy volunteers allowed
Yes

Age group
Child

Lower age limit
13 Years

Upper age limit
16 Years

Sex
All

Total final enrolment
180

Key exclusion criteria
1. Diagnosed neurological or psychiatric disorders
2. History of traumatic brain injury with loss of consciousness >5 minutes
3. Current use of psychoactive medications
4. Diagnosed learning disabilities or developmental disorders
5. Contraindications for fNIRS assessment (e.g., scalp conditions)
6. Participation in other cognitive training programs within the past 6 months

Date of first enrolment
19/09/2024

Date of final enrolment
25/10/2024

Locations

Countries of recruitment

China

Sponsor information

Organisation
Kyonggi University

ROR
https://ror.org/032xf8h46

Funder(s)

Funder type

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan
De-identified individual participant data underlying the published results, together with a data dictionary, will be available upon reasonable request to the corresponding author (Duyao99888@163.com) after publication, subject to institutional and ethics committee approval.

IPD sharing plan summary
Available on request