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# Network characteristics of depression and anxiety symptoms among college students and exercise intervention programs

**Submission date**
07/09/2025

**Recruitment status**
No longer recruiting

**Registration date**
10/09/2025

**Overall study status**
Completed

**Last Edited**
09/09/2025

**Condition category**
Mental and Behavioural Disorders

[ ] 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
This research will explore the classification and network characteristics of depression and anxiety symptoms among college students, identify the core symptoms and bridging symptoms of each category, and provide targets for exercise intervention. It plans to clarify the dose-effect relationship of physical exercise in improving the core symptoms and bridging symptoms of different types of depression and anxiety among college students, and provide scientific evidence for the construction of precise exercise intervention plans.

Who can participate?
Healthy volunteer college students aged 18-26 years old

What does the study involve?
This study mainly recruits college student groups as research subjects. After obtaining the permission of the school's cooperating unit, recruitment posters were posted in the school's bulletin board, and recruitment information was released through social media. After voluntary registration, relevant participants were selected through questionnaire screening. The research subjects were randomly grouped into the depression symptom group and the healthy control group.

Firstly, the promotion and recruitment will be carried out through teacher publicity, posting posters, and pushing on WeChat official accounts. Questionnaires will be distributed through Qiwangxing, including basic information forms, the IPAQ short questionnaire, the Pittsburgh Sleep Quality Index (PSQI), the Beck Depression Inventory-II (BDI-II), the physical activity rating scale-3 (PARS-3), the generalized anxiety disorder scale-gad-7, the trait anxiety scale, and the SAS anxiety self-assessment scale.

For the first visit to the laboratory, the participants will fill out the informed consent form, complete the depression adjectives checklist, the Behavioral Inhibition/Activation System questionnaire (BIS/BAS), resting electroencephalogram collection (in the delta frequency band (1-4 Hz), theta frequency band (4-8 Hz), alpha1 frequency band (8-10.5 Hz), alpha2 frequency

band (10.5-13 Hz), beta1 frequency band (13-20 Hz) and beta2 frequency band (20-30 Hz)), inhibition function (Go-Nogo and Stroop), working memory (N-back), and switching function (More-Odd Shifting), ERP collection (N200 and P300, etc.), and physical fitness (the AI intelligent body fitness tester side unit, which tests the physical fitness of the participants. It involves height, weight, and BMI (1) Reaction time: reaction time. (2) Upper limb strength: grip strength. (3) Cardiopulmonary capacity: lung capacity. (4) Flexibility: sit-to-stand. Then, complete the 8-week exercise intervention and the above tests after the post-test.

What are the possible benefits and risks of participating?
Possible benefits
Participating in this study can help volunteers know whether they are currently in a depressed state, providing a basis for eliminating depressive emotions in the future, improving sleep quality, and formulating appropriate exercise plans. Furthermore, the results of this study will benefit more people because it will help the research team better understand how to formulate effective depression exercise programs.

Potential risks
1) Questionnaire survey, interviews, etc.:
Participation in this study may involve some risks. For example, volunteers may feel depressed after completing the survey. Some questions may be very sensitive and may make volunteers feel uncomfortable. However, these risks are merely "minor risks". In addition, if a question makes volunteers feel unhappy, they can terminate the survey or choose not to answer this question at any time. If volunteers want to talk to someone about your feelings towards this study, the researchers can introduce a psychological counselor for them to provide psychological counseling.
2) Physical fitness test
Participation in this study may involve certain risks. During exercise intervention, volunteers may experience adverse reactions. For example, volunteers may feel short of breath, muscle pain, and exercise fatigue. During this process, the researchers will monitor your heart rate changes and breathing difficulties. If volunteers experience any adverse reactions, they can inform the researchers immediately, and the researchers will stop the experiment immediately.

Where is the study run from?
The university sports laboratory of Shanghai Business School, China.

When is the study starting and how long is it expected to run for?
June 2024 to June 2025.

Who is funding the study?
The Shanghai Sports University, China.

Who is the main contact?
Xu Qiong, susxuqiong@163.com

# Contact information

### Type(s)
Public, Scientific, Principal investigator

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# Additional identifiers

**Clinical Trials Information System (CTIS)**
Nil known

**ClinicalTrials.gov (NCT)**
Nil known

**Protocol serial number**
Nil known

# Study information

**Scientific Title**
The effects of different intensities and forms of exercise on the executive functions of college students with depressive symptoms

**Acronym**
Exercise

**Study objectives**
The effects of HIIT, MICT, and HIFT - three different forms and intensities of exercise - on the executive functions of college students with depressive symptoms

## Ethics approval required
Ethics approval required

## Ethics approval(s)
approved 08/10/2024, Scientific Research Ethics Committee of Shanghai University of Sport (Shanghai Sport University, 200 Hengren Road, Yangpu District, Shanghai, 200438, China; +86 021-65508179; lunli@sus.edu.cn), ref: 102772024RT108

## Study design
Interventional unblinded open-label randomized controlled trial single-center study

## Primary study design
Interventional

## Study type(s)
Prevention, Treatment, Efficacy

## Health condition(s) or problem(s) studied
College students with depressive symptoms

## Interventions
Firstly, through teacher promotion, posting posters, and sending WeChat public accounts, etc., for publicity and recruitment, and by distributing questionnaires through Questionnaire Star, including basic information form, Physical Activity Questionnaire (short version of IPAQ), Pittsburgh Sleep Quality Index (PSQI), Beck Depression Inventory-2nd Edition (BDI-II), Physical Activity Rating Scale-3 (PARS-3), GAD-7 Generalized Anxiety Disorder Scale, Trait Anxiety Scale, and SAS Anxiety Self-Measurement Scale, for screening before the start of the research. (Week 0)

Approximately 116 people were recruited and completed randomization grouping (no allocation concealment), visited the laboratory for the first time, and filled out the informed consent form, and completed the research tests: depression adjective checklist, Behavioral Inhibition /Activation System Scale (BIS/BAS), resting electroencephalogram collection (delta frequency band (1-4 Hz), theta frequency band (4-8 Hz), alpha1 frequency band (8-10.5 Hz), alpha2 frequency band (10.5-13 Hz), beta1 frequency band (13-20 Hz) and beta2 frequency band (20-30 Hz)), inhibition function (Go-Nogo and Stroop), working memory (N-back), and conversion function (More-Odd Shifting), ERP collection (N200 and P300, etc.) and physical fitness (testing the physical fitness of the subjects. Involving height, weight, BMI, etc. (1) Upper limb strength: grip strength (2) Cardiopulmonary capacity: vital capacity. (3) Pulmonary function: step test. (4) Flexibility: sit-to-stand.

Then complete the 8-week exercise intervention and the above tests at the post-test.

The intervention group has HIIT, three times a week, the intensity of the program is controlled at 70%-95% HRmax, with an average of 85% HRmax fluctuation. The exercise time is 35 minutes, involving 10 minutes preparation (reaching the target heart rate range) + 20 minutes exercise + 5 minutes relaxation; among which the high-intensity interval treadmill exercise lasts for 20 minutes, the time allocation is 2 minutes (high-intensity running) + 3 minutes brisk walking, a total of four groups.

The MICT group's program, a moderate-intensity treadmill exercise program, intensity control at 65%-76% HRmax, with an average of 70% HRmax fluctuation, 20 minutes exercise + 5 minutes relaxation, 3 times a week practice, a total of 35 minutes of exercise. The HIFT program consists of a 20-minute high-intensity multi-joint functional exercise combination. Before the high-intensity training, participants performed 10 minutes of dynamic warm-up + 5 minutes of cool-down. The HIFT program includes 30 seconds of high-intensity "anaerobic exercise" (such as sprinting, jumping) combined with 30 seconds of self-weight/freeweight resistance exercise (such as push-ups, squats, weightlifting), followed by another 30 seconds of high-intensity "anaerobic exercise" combined with 30 seconds of self-weight/freeweight resistance exercise. Initially, only body weight was used, and the difficulty gradually increased, including the use of free weights. After one round of exercise, the subjects rested for 2 minutes, and then repeated 4 times, for a total of 5 cycles.
During the 8-week intervention, the control group did not undergo any physical exercise intervention, maintained their campus lifestyle, and received irregular visits.
After the 8-week intervention (the 9th week), the participants came to the laboratory to complete the research tests. Follow-up was conducted for three months, with the Beck Depression Inventory-2 (BDI-2) completed every four weeks (at the 13th week, 17th week, and 21st week)

## Intervention Type
Behavioural

## Primary outcome(s)
Cognitive neurological indicators, measured using a brain cap to collect executive function ERP components (N200 and P300), inhibition function was measured using Go-Nogo and Stroop tasks, at Week 0 and Week 9

## Key secondary outcome(s))
1. Physical activity level was measured using the Physical Activity Questionnaire (IPAQ short version) at Week 0 and Week 9
2. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) at Week 0 and Week 9
3. Depression symptoms were measured using the Beck Depression Inventory-II (BDI-II) at Week 0, Week 9, Week 13, Week 17, and Week 21
4. Physical activity rating was measured using the Physical Activity Rating Scale-3 (PARS-3) at Week 0 and Week 9
5. Generalized anxiety symptoms were measured using the GAD-7 scale at Week 0 and Week 9
6. Trait anxiety was measured using the Trait Anxiety Scale at Week 0 and Week 9
7. Anxiety symptoms were measured using the SAS Anxiety Self-Assessment Scale at Week 0 and Week 9
8. Depression-related adjectives were measured using the Depression Adjective Checklist at Week 0 and Week 9
9. Behavioral inhibition/activation was measured using the BIS/BAS Scale at Week 0 and Week 9
10. Resting brain activity was measured using EEG frequency bands at Week 0 and Week 9
11. Working memory was measured using the N-back task at Week 0 and Week 9
12. Cognitive flexibility was measured using the More-Odd Shifting task at Week 0 and Week 9
13. Physical fitness was measured using tests of height, weight, BMI, grip strength, vital capacity, step test, and sit-to-stand forward bend at Week 0 and Week 9

## Completion date

30/06/2025

# Eligibility

### Key inclusion criteria
1. Age between 18 and 24 years old
2. College students with depression symptoms who scored 14-19 on the Beck Depression Inventory-II
3. No history of mental illness and no current chronic diseases
4. Normal binocular vision or corrected vision, no color blindness or color weakness
5. Righthanded
6. Have not participated in regular exercise in the past three months
7. Voluntary participation in this experimental study

### Participant type(s)
Learner/student

### Healthy volunteers allowed
No

### Age group
Adult

### Lower age limit
24 years

### Upper age limit
18 years

### Sex
All

### Total final enrolment
116

### Key exclusion criteria
1. Suffering from severe cardiovascular diseases or major organic disorders
2. Having poor vision or hearing and being unable to complete the test
3. Taking long-term or recent medications that affect mental state or physical activity ability, such as psychotropic drugs, cholinergic inhibitors, etc.
4. Being lefthanded
5. There are contraindications for exercise
6. Not involved in this experimental study

### Date of first enrolment
12/03/2025

### Date of final enrolment
04/06/2025

# Locations

**Countries of recruitment**
China

**Study participating centre**
**Shanghai Business School**
No. 6333, Dongfang Meigu Avenue, Fengxian District
Shanghai
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# Sponsor information

**Organisation**
Shanghai University of Sport

**ROR**
https://ror.org/0056pyw12

# Funder(s)

**Funder type**
University/education

**Funder Name**
Shanghai University of Sport

**Alternative Name(s)**

**Funding Body Type**
Private sector organisation

**Funding Body Subtype**
Universities (academic only)

**Location**
China

# Results and Publications

## Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are/will be available upon request from Xu Qiong, at susxuqiong@163.com

## IPD sharing plan summary

Available on request