

# Effects of whole-body vibration training on balance and ankle awareness in stroke survivors

<b>Submission date</b> 22/07/2024	<b>Recruitment status</b> No longer recruiting	<input type="checkbox"/> Prospectively registered
		<input type="checkbox"/> Protocol
<b>Registration date</b> 29/07/2024	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan
		<input checked="" type="checkbox"/> Results
<b>Last Edited</b> 02/10/2024	<b>Condition category</b> Musculoskeletal Diseases	<input checked="" type="checkbox"/> Individual participant data

## Plain English summary of protocol

### Background and study aims

Although whole-body vibration (WBV) training is acknowledged for its benefits in enhancing motor functions across several neurological disorders, its precise influence on ankle joint proprioception (the body's ability to sense movement, action, and location) and balance in stroke patients is still not well understood. This research seeks to assess the impact of WBV training on ankle joint proprioception and balance in stroke patients, thereby filling this important research void.

### Who can participate?

Patients aged  $\geq 30$  years old after their first-episode stroke, defined as individuals with no prior stroke events.

### What does the study involve?

Thirty-five stroke patients will be randomly assigned to either the WBV group ( $n = 17$ ) or a control group ( $n = 18$ ) using a random number table method. The control group will receive daily general rehabilitation for four weeks, while the WBV group will receive an additional 30 minutes of WBV training each day with the Trunsan S110 Vibration Training System. Assessments will be conducted at baseline and after four weeks of intervention, using various scales and tests for ankle joint proprioception and balance.

### What are the possible benefits and risks of participating?

The possible benefit of the WBV training is to help restore ankle joint proprioception and balance in stroke patients. No serious or other adverse events are expected during the follow-up of studies.

### Where is the study run from?

The Rehabilitation Medicine Department, the First Affiliated Hospital of the University of Science and Technology of China

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

February 2020 to May 2022

Who is funding the study?

This research was funded by a grant from Anhui Province Twelfth Five-Year Clinical Medicine Key Specialty (Grant No. ZD125\_0013), Key Technologies R&D Program of Anhui Province (Grant No. 202004h07020017), and the Fundamental Research Funds for the Central Universities (Grant No. WK9110000134).

Who is the main contact?

Jingsong Mu, jsmu@ustc.edu.cn

## Contact information

### Type(s)

Public, Scientific, Principal investigator

### Contact name

Dr Jingsong Mu

### Contact details

17 Lujiang Road, Luyang District  
Hefei, Anhui Province  
China  
230001  
+86 0551-62283114  
jsmu@ustc.edu.cn

## Additional identifiers

### Clinical Trials Information System (CTIS)

Nil known

### Protocol serial number

Funder grant numbers: ZD125\_0013, 202004h07020017, WK9110000134

## Study information

### Scientific Title

Impact of whole-body vibration training on ankle joint proprioception and balance in stroke patients: A prospective cohort study

### Study objectives

Whole-body vibration (WBV) training will significantly improve both balance and proprioceptive abilities

### Ethics approval required

Ethics approval required

### Ethics approval(s)

approved 03/04/2022, Ethics Committee of the First Affiliated Hospital of the University of Science and Technology of China (17 Lujiang Road, Luyang District, Hefei, Anhui Province, 230001, China; +86 0551-62282931; ahslyllwyh@163.com), ref: XJS2020-1-5 (NK)

## **Study design**

Single-center prospective cohort study

## **Primary study design**

Observational

## **Study type(s)**

Efficacy

## **Health condition(s) or problem(s) studied**

Restoration of ankle joint proprioception and balance in stroke patients

## **Interventions**

Thirty-five stroke patients will be randomly assigned to either the (whole body vibration) WBV group (n = 17) or a control group (n = 18) using a random number table method. The control group will receive daily general rehabilitation for four weeks, while the WBV group will receive an additional 30 minutes of WBV training each day with the Trunsan S110 Vibration Training System. Blinded outcome assessments will be conducted at baseline and post-treatment, using the Berg balance scale (BBS), functional reach test (FRT), Romberg test length (RTL) and area (RTA), and completion rates of ankle joint dorsiflexion-plantar flexion (DP) and inversion-eversion (IE) tests. Follow-up assessments will be performed after four weeks of intervention.

Data will be analyzed using SPSS 26.0 (SPSS, Inc., Chicago, IL). The measurement data will be expressed as mean  $\pm$  standard deviation (SD). Upon confirming the homogeneity of variances, independent samples t-tests will be used for inter-group analyses, while paired-sample t-tests will be employed for intra-group comparisons. For data sets not following the normal distribution, Mann-Whitney U tests and Wilcoxon signed-rank tests will be employed. A correlation analysis will be performed to explore the correlation between DP (times) and IE (times). Moreover, multiple linear regressions will be conducted to explore the existence of confounders. A P-value of less than 0.05 will be deemed indicative of statistical significance.

## **Intervention Type**

Procedure/Surgery

## **Primary outcome(s)**

Measured using the TecnoBody PROKIN System (PK252) at baseline and after four weeks of intervention:

1. Balance measured using the Romberg test length (RTL).
2. Stability measured using the Romberg test area (RTA).
3. Ankle joint flexibility measured using the completion rates of ankle joint dorsiflexion-plantar flexion (DP).
4. Foot stability measured using the inversion-eversion (IE) tests.

## **Key secondary outcome(s)**

Assessed at baseline and after four weeks of intervention:

1. Aspects of balance, such as sitting to standing and standing on one foot, measured using the

Berg balance scale (BBS) score

2. Maximum reach distance beyond arm's length in a standing position measured using the functional reach test (FRT)

**Completion date**

20/05/2022

**Eligibility**

**Key inclusion criteria**

1. Eligible participants ( $\geq 30$  years of age) were first-episode stroke patients, defined as individuals with no prior stroke events
2. Stroke diagnosis was confirmed through CT or MRI, with characteristic imaging features: low attenuation in ischemic strokes or high/mixed-intensity signals in hemorrhagic strokes, accompanied by hemiplegia
3. Participants had stable vital signs (heart rate: 60–100 bpm; blood pressure: 90/60 to 120/80 mmHg; respiration: 16–26 breaths per minute; temperature: 36.5–37.3 °C) and cognitive function (mini-mental state examination (MMSE) score  $> 27$ )
4. Additionally, they were required to maintain an independent standing balance

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Mixed

**Lower age limit**

30 years

**Upper age limit**

100 years

**Sex**

All

**Total final enrolment**

58

**Key exclusion criteria**

1. Severe complications such as major neurological deficits or severe aphasia that could impede study involvement
2. Severe cardiovascular conditions posing significant health risks, including hypertension (systolic  $\geq 180$  mmHg or diastolic  $\geq 120$  mmHg), heart failure with an ejection fraction  $< 35\%$ , symptomatic coronary artery disease, and severe valvular heart disease, following the American College of Cardiology and American Heart Association guidelines
3. Advanced bone and joint diseases affecting participation, such as severe osteoarthritis, rheumatoid arthritis, recent or unhealed fractures, or significant post-surgical limitations

4. Recent lower extremity venous thrombosis, defined as episodes within the last six months, which could be aggravated by study activities
5. Cognitive impairments severe enough to interfere with understanding instructions or providing informed consent, like advanced dementia or significant intellectual disability, regardless of MMSE scores

**Date of first enrolment**

01/03/2020

**Date of final enrolment**

15/05/2022

## Locations

**Countries of recruitment**

China

**Study participating centre**

**The First Affiliated Hospital of the University of Science and Technology of China**

17 Lujiang Road, Luyang District, Division of Life Sciences and Medicine

Hefei, Anhui Province

China

230001

## Sponsor information

**Organisation**

University of Science and Technology of China

**ROR**

<https://ror.org/04c4dkn09>

## Funder(s)

**Funder type**

Not defined

**Funder Name**

Anhui Province Twelfth Five-Year Clinical Medicine Key Specialty

**Funder Name**

Key Technologies Research and Development Program of Anhui Province

**Alternative Name(s)**

Key Technologies R & D Program of Anhui Province

**Funding Body Type**

Government organisation

**Funding Body Subtype**

Local government

**Location**

China

**Funder Name**

Fundamental Research Funds for the Central Universities

**Alternative Name(s)**

Fundamental Research Funds for the Central Universities of China, Fundamental Research Fund for the Central Universities

**Funding Body Type**

Government organisation

**Funding Body Subtype**

Local government

**Location**

China

## Results and Publications

**Individual participant data (IPD) sharing plan**

The type of data that will be shared:

Data for analysis in Microsoft Word (.xlsx). (see outputs table)

Timing for availability:

Immediately after publication

Whether consent from participants was required and obtained:

Yes, consent was obtained from participants (Informed Consent Form in Chinese).

Comments on data anonymization:

All data will be anonymized to ensure participant privacy.

Any ethical or legal restrictions:

Data sharing will be in compliance with ethical guidelines and institutional policies.

Any additional comments:

The datasets generated during and/or analysed during the current study will be available upon request from Jingsong Mu, [jsmu@ustc.edu.cn](mailto:jsmu@ustc.edu.cn)

### IPD sharing plan summary

Available on request

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Results article</a>		01/10/2024	02/10/2024	Yes	No
<a href="#">Dataset</a>			29/07/2024	No	No
<a href="#">Participant information sheet</a>			29/07/2024	No	Yes