Clinical Trial Protocol
Iranian Registry of Clinical Trials

07 Nov 2026

The effect of transcranial direct and pulsed current stimulation on motor learning and cortical activity in older adults

Protocol summary

Study aim
The effect of transcranial direct and pulsed current stimulation on motor learning and cortical activity in older adults

Design
A clinical trial with a control group, parallel groups, double-blind, randomized, 72 participants in 3 groups of 24 people.

Settings and conduct
Neuromuscular Rehabilitation Research Center Semnan University of Medical Sciences.

Participants/Inclusion and exclusion criteria
Inclusion criteria: Age 60 to 75 years; Participants should be right-handed; Obtain a score of 21 to 24 through the memory impairment test; The minimum education is a diploma and the maximum is a master's degree. Exclusion Criteria: History of neurological diseases such as Parkinson's, Alzheimer's, and schizophrenia; History of psychological diseases; Use of any sedative medications in the past two days; Suffering from color blindness; Movement disorders in the upper limb of the right hand.

Intervention groups
Intervention group 1:In this group, according to the protocol, the direct currents of the transcranial direct current stimulation device will be used for 20 minutes, and the intensity of 2 mA in the area of the primary motor cortex (M1). Intervention group 2: In this group, according to the protocol, the pulse currents of the transcranial pulse current stimulation device will be used for 20 minutes, and the intensity of 2 mA with a random frequency between 6 and 10 Hz on the area of the primary motor cortex (M1). Control group: In this group, transcranial pulsed current stimulation and direct Transcranial direct-current stimulation are randomly used, and the current is automatically cut off after 30 seconds and is only for comparison with the intervention group.

Main outcome variables
Movement learning; Implicit learning; The amount of brain activity.

General information

Reason for update

Acronym

IRCT registration information
IRCT registration number: **IRCT20151228025732N79**
Registration date: **2023-07-30, 1402/05/08**
Registration timing: **prospective**

Last update: **2023-07-30, 1402/05/08**
Update count: **0**

Registration date
2023-07-30, 1402/05/08

Registrant information

Name
Alireza Emadi

Name of organization / entity
Semnan University of Medical Sciences, Semnan, Iran

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Iran (Islamic Republic of)

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Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2023-08-05, 1402/05/14

Expected recruitment end date
2024-01-21, 1402/11/01

Actual recruitment start date
empty

Actual recruitment end date
empty

Trial completion date
empty

Scientific title
The effect of transcranial direct and pulsed current stimulation on motor learning and cortical activity in older adults

Public title
The effect of transcranial direct and pulsed current stimulation on motor learning and cortical activity in older adults

Purpose
Diagnostic

Inclusion/Exclusion criteria

Inclusion criteria:
Age 60 to 75 years Participants should be right-handed Obtaining a score of 21 to 24 through the memory impairment test The minimum education is a diploma and the maximum is a master's degree

Exclusion criteria:
History of neurological diseases such as Parkinson's, Alzheimer's, schizophrenia History of psychological diseases Use of any sedative medications in the past two days Suffering from color blindness Movement disorders in the upper limb of the right hand

Age
From **60 years** old to **75 years** old

Gender
Both

Phase
N/A

Groups that have been masked

- Participant
- Outcome assessor
- Data analyser

Sample size
Target sample size: **72**

Randomization (investigator's opinion)
Randomized

Randomization description
Based on the random block method with the size of 6 blocks; we will assign 1 to 6 for each block. Then, using the random number table, based on the sample size, 12 units of 6 blocks will be selected so that we consider having 24 people in group (A), 24 people in group (B), and 24 people in group (C). Therefore, we will do block randomization.

Blinding (investigator's opinion)
Double blinded

Blinding description
Blinding of the analyst, the outcome evaluator and the participant (double-blind) is done so that the groups are defined as A, B, and C for the patients and provided to the analyst and the outcome evaluator so they do not know about the grouping method.

Placebo
Not used

Assignment
Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee
Ethics committee of Tehran University of Medical Sciences

Street address
Dr. Mirkhani St. (East Nusrat), Tawheed Square

City
Tehran

Province
Tehran

Postal code
1419733171

Approval date
2023-05-29, 1402/03/08

Ethics committee reference number
IR.TUMS.FNM.REC.1402.038

Health conditions studied

1

Description of health condition studied
Movement disorder

ICD-10 code
F82

ICD-10 code description
Specific developmental disorder of motor function

Primary outcomes

1

Description
Movement learning

Timepoint
The first session, the last session and 2 weeks after the intervention

Method of measurement
The Color Matching Test (CMT) software will record and measure the time of the homework.

2

Description
Implicit learning

Timepoint
The first session, the last session and 2 weeks after the intervention

Method of measurement
The Color Matching Test (CMT) software will record and measure the time of the homework.

3

Description
The amount of brain activity
Timepoint
The first session, the last session and 2 weeks after the intervention
Method of measurement
Electroencephalography device and MATLAB and EEGLAB software are used.

Secondary outcomes

empty

Intervention groups

1

Description
Intervention group 1:In this group, according to the protocol, the direct currents of the transcranial direct current stimulation device will be used for 20 minutes and the intensity of 2 mA in the area of the primary motor cortex (M1).
Category
Treatment - Devices

2

Description
Intervention group 2: In this group, according to the protocol, the pulse currents of the transcranial pulse current stimulation device will be used for 20 minutes and the intensity of 2 mA with a random frequency between 6 and 10 Hz on the area of the primary motor cortex (M1).
Category
Treatment - Devices

3

Description
Control group: In this group, transcranial pulsed current stimulation and direct Transcranial direct-current stimulation are randomly used, and the current is automatically cut off after 30 seconds and is only for comparison with the intervention group.
Category
Diagnosis

Recruitment centers

1

Recruitment center
Name of recruitment center
Neuromuscular Rehabilitation Research Center
Full name of responsible person
Nastaran Ghotbi
Street address
Neuromuscular Rehabilitation Research Center, Qods Blvd, Mashahir Aven.
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Sponsors / Funding sources

1

Sponsor
Name of organization / entity
Tehran University of Medical Sciences
Full name of responsible person
Hamid Dalvand
Street address
Faculty of Rehabilitation, Pich Shamiran, Enghelab St., Tehran
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rehabilitation@tums.ac.ir
Grant name
Grant code / Reference number
Is the source of funding the same sponsor organization/entity?
Yes
Title of funding source
Tehran University of Medical Sciences
Proportion provided by this source
100
Public or private sector
Public
Domestic or foreign origin
Domestic
Category of foreign source of funding
empty
Country of origin
Type of organization providing the funding
Academic

Person responsible for general inquiries

Contact
Name of organization / entity
Tehran University of Medical Sciences
Full name of responsible person
Nastaran Ghotbi
Position
Professor
Latest degree

Ph.D.

Other areas of specialty/work
Physiotherapy

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Person responsible for updating data

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Sharing plan

Deidentified Individual Participant Data Set (IPD)
Undecided - It is not yet known if there will be a plan to make this available

Study Protocol
Undecided - It is not yet known if there will be a plan to make this available

Statistical Analysis Plan
No - There is not a plan to make this available

Informed Consent Form
No - There is not a plan to make this available

Clinical Study Report
No - There is not a plan to make this available

Analytic Code
No - There is not a plan to make this available

Data Dictionary
No - There is not a plan to make this available