

Clinical Trial Protocol

Iranian Registry of Clinical Trials

16 Sep 2026

Evaluation of the effects of repetitive transcranial magnetic stimulation on working memory performance in patients with multiple sclerosis by source localization with EEG and MRI

Protocol summary

Study aim

Evaluation of the effects of repetitive transcranial magnetic stimulation on working memory performance in patients with multiple sclerosis by source localization with EEG and MRI

Design

Phase 2-3 clinical trials are performed on 60 patients in parallel groups to evaluate the effect of repetitive brain stimulation on working memory.

Settings and conduct

This study is performed in Kashani Hospital. Patients with MS will be treated for brain stimulation in two ways, and the amount of working memory before and after treatment will be compared.

Participants/Inclusion and exclusion criteria

Inclusion criteria: diagnosis of MS by a neurologist, age 18 to 65 years, informed consent to participate in the study and have a minimum literacy
Exclusion criteria: Existence of serious suicide plan or thoughts, use of anti-depressant and anti-anxiety drugs, pregnancy or breastfeeding, and contraindications to using the device

Intervention groups

Intervention group 1: Patients in this group undergo brain waves and brain anatomy in areas related to working memory before interventions. They will then undergo 5 sessions of treatment by repeated transcranial magnetic stimulation with routine location (method 10-20). Intervention group 2: Patients in this group undergo brain waves and brain anatomy in areas related to working memory before interventions. They will then undergo 5 therapeutic sessions by repeated transcranial magnetic stimulation using location-based mapping. At the end of the last session, the MRI and MRI will be re-examined, and the brain waves and anatomy of the working memory-related areas will be examined.
Control group: In this group, only healthy people will be examined by MRI and brain anatomy by MRI, and brain

waves and anatomy of areas related to their working memory will be examined.

Main outcome variables

Electroencephalogram signals, brain anatomy in memory-related areas

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20210614051574N11**

Registration date: **2022-04-27, 1401/02/07**

Registration timing: **prospective**

Last update: **2022-04-27, 1401/02/07**

Update count: **0**

Registration date

2022-04-27, 1401/02/07

Registrant information

Name

Ghasem Mohammadsharifi

Name of organization / entity

Country

Iran (Islamic Republic of)

Phone

+98 31 3729 4005

Email address

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2022-06-21, 1401/03/31

Expected recruitment end date

2022-07-20, 1401/04/29

Actual recruitment start date

empty

Actual recruitment end date

empty

Trial completion date

empty

Scientific title

Evaluation of the effects of repetitive transcranial magnetic stimulation on working memory performance in patients with multiple sclerosis by source localization with EEG and MRI

Public title

Repetitive transcranial magnetic stimulation and working memory

Purpose

Treatment

Inclusion/Exclusion criteria**Inclusion criteria:**

Diagnosis of MS by a neurologist Age 18 to 65 years Informed consent to participate in the study Have a minimum literacy

Exclusion criteria:

Existence of a suicidal plan or serious thoughts Taking antidepressants and anti-anxiety drugs Pregnancy or breastfeeding Contraindications to the use of the device

Age

From **18 years** old to **65 years** old

Gender

Both

Phase

N/A

Groups that have been masked

No information

Sample size

Target sample size: **60**

Randomization (investigator's opinion)

Not randomized

Randomization description**Blinding (investigator's opinion)**

Not blinded

Blinding description**Placebo**

Not used

Assignment

Parallel

Other design features**Secondary Ids**

empty

Ethics committees**1****Ethics committee****Name of ethics committee**

Ethics committee of Esfahan University of Medical Sciences

Street address

Esfahan University of Medical Sciences, Hezar Jarib Ave., Esfahan

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Postal code

8174673461

Approval date

2021-05-20, 1400/02/30

Ethics committee reference number

IR.MUI.MED.REC.1400.126

Health conditions studied**1****Description of health condition studied**

Multiple sclerosis

ICD-10 code

G35

ICD-10 code description

Multiple sclerosis

Primary outcomes**1****Description**

Electroencephalogram signals

Timepoint

Before starting treatment and after the last session of brain stimulation

Method of measurement

By electroencephalogram

2**Description**

Anatomy of the brain in areas related to memory

Timepoint

Before starting treatment and after the last session of brain stimulation

Method of measurement

MRI machine

Secondary outcomes

empty

Intervention groups**1****Description**

Intervention group 1: Patients in this group undergo brain waves and brain anatomy in areas related to working memory before interventions. They will then undergo 5 sessions of treatment by repeated transcranial magnetic stimulation with routine location (method 10-20). After the last session, they will be re-examined on MRI and MRI and brain waves and anatomy

Work memory related will be examined.

Category

Treatment - Devices

2

Description

Intervention group 2: Patients in this group undergo brain waves and brain anatomy in areas related to working memory before interventions. They will then undergo 5 therapeutic sessions by repeated transcranial magnetic stimulation using location-based mapping. At the end of the last session, the MRI and MRI will be re-examined, and the brain waves and anatomy of the working memory-related areas will be examined.

Category

Treatment - Other

3

Description

Control group: In this group, only healthy people will be examined by MRI and brain anatomy by MRI, and brain waves and anatomy of areas related to their working memory will be examined.

Category

N/A

Recruitment centers

1

Recruitment center

Name of recruitment center

Kashani hospital

Full name of responsible person

Majid Barakatin

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No. 22, Roshd Ave., Daneshgah Blvd., Isfahan

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Sponsors / Funding sources

1

Sponsor

Name of organization / entity

Esfahan University of Medical Sciences

Full name of responsible person

Shaghayegh Haghjoo

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Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

Yes

Title of funding source

Esfahan 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

Esfahan University of Medical Sciences

Full name of responsible person

Majid Barakatin

Position

Specialist

Latest degree

Specialist

Other areas of specialty/work

Neuroscience

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Sharing plan**Deidentified Individual Participant Data Set (IPD)**

Yes - There is a plan to make this available

Study Protocol

Yes - There is a plan to make this available

Statistical Analysis Plan

Yes - There is a plan to make this available

Informed Consent Form

Yes - There is a plan to make this available

Clinical Study Report

Yes - There is a plan to make this available

Analytic Code

Yes - There is a plan to make this available

Data Dictionary

Yes - There is a plan to make this available

Title and more details about the data/document

All data can be shared after people have requested.

When the data will become available and for how long

Six months after publishing the results.

To whom data/document is available

Academic researchers

Under which criteria data/document could be used

Scientific uses

From where data/document is obtainable

Website of the Research Committee of Isfahan University of Medical Sciences

What processes are involved for a request to access data/document

Clear request on the site to access the data by the individual and then review the request by the research assistant within 2 weeks and then allow access to the data.

Comments**Person responsible for updating data****Contact****Name of organization / entity**

Esfahan University of Medical Sciences

Full name of responsible person

Majid Barakatin

Position

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Latest degree

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Other areas of specialty/work

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