Clinical Trial Protocol
Iranian Registry of Clinical Trials

07 Nov 2026

Effect of aquatic based HIIT training on serum levels of BDNF, NGF,GDNF and Physical function in patients with Multiple sclerosis

Protocol summary

Study aim
To evaluate the effects of aquatic high intensity interval training on serum levels of nerve growth factor (NGF), brain derived neurotrophic factor (BDNF), glial cell line derived neurotrophic factor (GDNF), and physical performance in patients with multiple sclerosis.

Design
A randomized, controlled, parallel-group, blinded clinical trial in 60 patients with MS; randomization will be performed using the RAND function in Microsoft Excel.

Settings and conduct
The study will be conducted at the Isfahan Multiple Sclerosis Society and an indoor swimming pool in Isfahan. Eligible participants will be randomly assigned to the intervention or control group after baseline assessment. The intervention group will participate in an 8-week aquatic high intensity interval training program, three sessions per week, while the control group will receive usual care. Because of the nature of the exercise intervention, participants and the instructor cannot be blinded. However, the outcome assessor and the data analyst will be blinded to group allocation.

Participants/Inclusion and exclusion criteria
Adults with relapsing remitting multiple sclerosis (RRMS), Expanded Disability Status Scale (EDSS) score 3 to 5, will be enrolled. Exclusion criteria include contraindications to exercise, pregnancy, or unwillingness to participate

Intervention groups
The intervention group will perform 8 week aquatic high intensity interval training, three sessions weekly. The control group will receive usual care.

Main outcome variables
The primary outcomes include serum levels of NGF, BDNF, and GDNF, and physical performance assessed using standardized tests.

General information

Reason for update

Acronym

IRCT registration information
IRCT registration number: **IRCT20260127068676N1**
Registration date: **2026-07-26, 1405/05/04**
Registration timing: **registered_while_recruiting**

Last update: **2026-07-26, 1405/05/04**
Update count: **0**

Registration date
2026-07-26, 1405/05/04

Registrant information
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Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2026-07-23, 1405/05/01

Expected recruitment end date
2026-08-22, 1405/05/31

Actual recruitment start date
empty

Actual recruitment end date
empty

Trial completion date
empty

Scientific title
Effect of aquatic based HIIT training on serum levels of BDNF, NGF,GDNF and Physical function in patients with

Multiple sclerosis

Public title
Effect of Hydrotherapy on Multiple Sclerosis
Purpose
Prevention
Inclusion/Exclusion criteria
Inclusion criteria:
Diagnosed with RR-type (relapsing-remitting) multiple sclerosis by MS (multiple sclerosis) expert neurologists, and Expanded Disability Status Scale (EDSS) cit 10 Score of 3-5 participated in this study. Being female Having a body mass index (BMI) between 25 and 29.9 kg/m² Not participating in regular physical activity programs in the past 6 months Having informed consent to participate in the research
Exclusion criteria:
Suffering from serious acute or chronic diseases, including uncompensated heart failure, angina pectoris, myocardial infarction, kidney diseases, uncontrolled hypertension, severe arthritis, active respiratory diseases, COVID-19, acute orthopedic problems, or severe chronic joint pain primary progressive MS Irregular participation in the exercise program and absence from more than three consecutive sessions or five intermittent sessions Failure to attend measurement sessions for dependent variables at the beginning and end of the intervention Participation in any systematic physical activity program outside the research protocol during the study period Experiencing a relapse during the study acute or chronic physical or psychological disorders
Age
From **28 years** old to **48 years** old
Gender
Female

Phase
N/A
Groups that have been masked

- Outcome assessor
- Data analyser

Sample size
Target sample size: **60**
Randomization (investigator's opinion)
Randomized
Randomization description
Initially, the statistical population consisted of patients with RRMS and an EDSS score between 3 and 5 from the city of Isfahan. After applying the inclusion and exclusion criteria, 45 individuals were selected purposively and voluntarily and were randomly allocated, using Random Allocation software, into two groups: a water-based high-intensity interval training group (25 individuals) and a control group (20 individuals). This type of randomization was simple randomization.
Blinding (investigator's opinion)
Double blinded
Blinding description
This research was a randomized controlled trial parallel two - arm design, investigating the effects of an eight-week water-based high-intensity interval training program on neurotrophic factors and physical performance in patients with Relapsing-Remitting Multiple Sclerosis (RRMS). To maximize the internal validity of the findings and prevent bias, the study implemented a rigorous blinding protocol at the levels of assessment and data analysis. Although blinding the participants or exercise trainers was not feasible due to the nature of the physical intervention, the research protocol was specifically designed to ensure that the assessors of physical performance, the laboratory technicians measuring the biochemical variables, and the statistical analysts remained completely unaware (blinded) of the participants' allocation to the intervention or control groups. This was achieved by coding all samples, separating the data collection process from group allocation knowledge, and providing the coded data to an independent statistician.
Placebo
Not used
Assignment
Parallel
Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee
Name of ethics committee
Research Ethics Committee of the University of Isfahan
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Azadi Square, Hezar Jarib Street, University of Isfahan
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Approval date
2025-08-16, 1404/05/25
Ethics committee reference number
IR.UI.REC.1404.124

Health conditions studied

1

Description of health condition studied
Multiple Sclerosis (MS)
ICD-10 code
ICD-10 code description

Primary outcomes

1

Description

Brain Drive Neurotrophic Factor (BDNF)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Blood Sample

2

Description

Nerve Growth Factor (NGF)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Blood Sample

3

Description

Physical Performance

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Physical performance will be assessed using the Timed Up and Go Test (TUGT), the 6-Minute Walk Test (6MWT), the 10-Meter Walk Test (10MWT), the 30-Second Sit-to-Stand Test (30STS), and the Berg Balance Scale (BBS).

4

Description

Soluble Neural Cell Adhesion Molecule (sNCAM)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Blood Sample

5

Description

glial cell line-derived neurotrophic factor (GDNF)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Blood Sample

Secondary outcomes

1

Description

Multiple Sclerosis Quality of Life-54 (MSQOL-54)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Quality of life will be assessed using the Multiple Sclerosis Quality of Life-54 (MSQOL-54) questionnaire.

2

Description

Cognitive Function

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Cognitive function will be assessed using the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Examination (MMSE).

3

Description

Expanded Disability Status Scale (EDSS)

Timepoint

At Baseline and After 8 Weeks of Intervention

Method of measurement

Disability status will be assessed using the Expanded Disability Status Scale (EDSS).

Intervention groups

1

Description

"The intervention group:" will participate in an 8-week aquatic high-intensity interval training (aHIIT) program, consisting of three sessions per week. Each session will include a 15-minute warm-up, 10 intervals of 30-second high-intensity exercise at 85–95% of maximum heart rate (HRmax) separated by 1-minute active recovery, and a 10-minute cool-down. Exercise intensity will be monitored using heart rate and the Borg Rating of Perceived Exertion (RPE), and all sessions will be supervised by a qualified instructor.

Category

Rehabilitation

2

Description

"Control group:" Participants in the control group will be placed on a wait-list and will receive their usual care during the 8-week study period. They will not receive the water-based high-intensity interval training program and will be asked to maintain their usual level of physical activity. After completion of the study, the exercise program will be offered to participants in the control group.

Category

Behavior

Recruitment centers

1

Recruitment center

Name of recruitment center

Isfahan MS Society

Full name of responsible person

Masoud Etemadifar

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Sponsors / Funding sources

1

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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
Vice President for Research and Technology
Proportion provided by this source
5
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

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Sharing plan

Deidentified Individual Participant Data Set (IPD)
No - There is not a plan to make this available

Justification/reason for indecision/not sharing IPD
Individual participant data will not be shared to protect participant confidentiality and in accordance with ethical requirements and data protection regulations. Study results will be reported only in aggregated form without identifying individual participants.

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
Not applicable

Data Dictionary
Not applicable

Title and more details about the data/document
Only part of the data, such as information related to the main outcome or similar details, can be shared.

When the data will become available and for how long
Access to the course begins 6 months after the publication of the results

To whom data/document is available
Researchers affiliated with academic institutions, sports trainers, physicians, and sports medicine professionals.

Under which criteria data/document could be used
Meta-analytic studies

From where data/document is obtainable
m.kargarfard@spr.ui.ac.ir

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

Comments