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A preliminary study investigating if muscle stimulation as an exercise therapy for people with multiple sclerosis helps strengthen muscles, improves walking, helps with tiredness, and reduces spasms

Submission date
24/01/2025

Recruitment status
Recruiting

Registration date
05/03/2025

Overall study status
Ongoing

Last Edited
02/01/2026

Condition category
Nervous System Diseases

[X] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol
Background and study aims
Multiple sclerosis (MS) is a condition where the body mistakenly attacks the brain and nerves, causing damage. MS is a lifelong condition that can worsen over time, leading to muscle tiredness, weakness, and balance problems, which can make walking difficult. Exercise can help, but many people with MS find it challenging due to tiredness, balance issues, needing help, and lack of confidence.
Muscle stimulation might help people with MS exercise more easily. It can be done at home using sticky pads on the skin that send painless electrical signals to make muscles contract, similar to exercising with weights. This could help prevent worsening muscle weakness, improve walking ability, increase physical activity, and reduce tiredness, helping people stay independent for longer.
The aim of this study is to gather information to plan a larger study to see if muscle stimulation can strengthen muscles, improve walking, reduce tiredness, and decrease muscle spasms in people with MS.

Who can participate?
People with MS can participate in this study if they:
- Have any form of MS
- Have problems with walking but can walk at least 20 meters without resting (with or without walking aids)

What does the study involve?
The study will involve 50 people with MS from two hospital clinics in Liverpool and Wolverhampton. Half of the participants, chosen randomly by a computer, will receive muscle stimulation along with their usual care. They will use the muscle stimulation equipment at home on their legs for 12 weeks. The other half will continue with their usual care.

Participants will have their muscle strength, walking ability, muscle spasms, and levels of tiredness measured at the start, after 3 months, and after 6 months. Both groups, along with their carers and clinicians, will be asked about their experiences with the study and reasons for not participating.

What are the possible benefits and risks of participating?
Benefits:
There are no guaranteed direct benefits, but participants will help gather information to plan a future study. The future study aims to see if muscle stimulation can help people with MS improve walking, get stronger, and feel less tired.

Risks or disadvantages:
Participants may not be placed in the group they prefer, which can be disappointing.
The skin may become red or irritated from the sticky pads, but this usually goes away quickly once stopped.
Some people might find the sensation uncomfortable at first but usually get used to it.
Participation requires time for visits and completing questionnaires.

Where is the study run from?
The study is being conducted at two hospital clinics in Liverpool and Wolverhampton.

When is the study starting and how long is it expected to run for?
November 2024 to October 2027

Who is funding the study?
The study is funded by the National Institute for Health and Care Research (NIHR207134) (UK)

Who is the main contact?
Dr Fraser Philp, f.philp@liverpool.ac.uk

Contact information

Type(s)
Public, Scientific, Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
341925

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
CPMS 61577, NIHR 207134, Protocol number: UoL001907

Study information

Scientific Title
A randomised controlled feasibility study investigating surface neuromuscular STIMulation as an exercise therapy versus usual care in people with multiple sclerosis to help improve lower limb strength, walking and fatigue (STIM-MS)

Acronym
STIM-MS

Study objectives
As this is an acceptability and feasibility study there is no null or alternative hypothesis.

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 28/02/2025, North West - Greater Manchester South Research Ethics Committee (2 Redman Place, Stratford Cross, London, E20 1JQ, United Kingdom; +44 (0)2071048065; gmsouth.rec@hra.nhs.uk), ref: 25/NW/0039

Study design
Randomized controlled feasibility study comparing surface neuromuscular electrical plus usual care versus usual care only with a nested qualitative study

Primary study design
Interventional

Study type(s)
Prevention, Quality of life, Treatment

Health condition(s) or problem(s) studied
Multiple Sclerosis (MS)

Interventions

Randomisation lists will be generated using block randomisation with random variable block length, stratified by site and multiple sclerosis type, and a 1:1 randomisation ratio. Lists will be produced by an independent statistician.

Intervention group - surface neuromuscular electrical stimulation (SNMES) and usual care
Following baseline measurements and randomisation, participants will be provided with the SNMES device (commercial constant current two channel electrical stimulator) and instructed how to use it at home. They will be advised to continue with their normal exercise and physical activity routines and will continue to receive their usual care.

The bilateral thigh (quadriceps and hamstrings) and shank (triceps surae and tibialis anterior) muscles will be stimulated. Each session will involve stimulating at least two muscle groups e.g. the quadriceps and hamstrings or triceps surae and tibialis anterior. The total session will last no more than 30 minutes and each muscle group will undergo a total of 45 contractions at a maximum tolerated intensity. Participants' limbs will be in a standard lower limb brace to ensure a maximum tolerable isometric contraction.

Stimulation parameters will be
-Frequency: 50Hz
- Pulse duration: 450µs
- ON:OFF time 5:10 secs
- Intensity: maximum tolerated

They will progressively work towards 3 to 4 sessions per week over a 12-week period for a maximum of 30 minutes across both legs.

Control group - usual care
The control group will continue to receive their usual care provided by their multiple sclerosis team. Participants will attend the clinic for baseline measurements and will complete the same outcome measures and assessments at equivalent timepoints to those in the SNMES arm

Both groups will receive a booklet diary that contains information about usual care, a diary for recording either use of the stimulator or usual care received, and contact details for support from the study team. They will also receive a phone call during weeks 1 and 6 to see how they are getting on.

Intervention Type
Device

Phase
Phase II

Drug/device/biological/vaccine name(s)
Commercially available, constant current two channel electrical stimulation device.

Primary outcome(s)
As this is an acceptability and feasibility study there is no primary outcome measure. An objective of this study is to collect data on candidate outcome measures to determine the primary outcome for the future trial and enable sample size calculations based on this.

Key secondary outcome(s))

1. Levels of functional disability measured using Expanded disability status scale (EDSS) at screening, 3 and 6 months.
2. Disease and demographic characteristics at baseline (age, sex, ethnicity, height, weight, disease subtype, years since diagnosis, annual relapse rate).
3. Number of relapses (total).
4. Level of impairment measured using type and number of walking aids used
5. Muscle function/balance measured using Timed up and Go (TUG) at baseline, 3 and 6 months.
6. Exercise tolerance measured using 2 minute walk test (2MWT) at baseline, 3 and 6 months.
7. Spasm frequency measured using Penn spasm frequency scale (PSFS) at baseline, 3 and 6 months.
8. Quality of life measured using Multiple Sclerosis Impact Scale (MSIS- 29) at baseline, 3 and 6 months.
9. Energy and drive (fatigue) measured using the fatigue severity scale (FSS) at baseline, 3 and 6 months.
10. Impact of fatigue on cognitive, physical and psychosocial function measured using Modified Fatigue Impact Scale – 5-item version (MFIS-5) at baseline, 3 and 6 months.
11. Measure of disability measured using World Health Organization Disability Assessment Schedule 2.0 - 36 version (WHODAS 2.0) at baseline, 3 and 6 months.
12. Health-related quality of life measured using European Quality of Life 5 Dimensions 5 Level Version (EQ-5D-5L) at baseline, 3 and 6 months.
13. Health resources and accessed measured using the Modular resource-use measure (ModRUM) at 3 and 6 months.
14. Lower limb pain measured using a numerical rating scale (lower limb pain) at baseline, 3 and 6 months.
15. Muscle stiffness measured using the Modified Ashworth Scale (MAS) at baseline, 3 and 6 months.
16. Lower limb range of movement ROM (Knee and ankle) measured at baseline, 3 and 6 months.
17. Lower limb strength measured using MRC Oxford strength assessment (Knee and ankle) measured at baseline, 3 and 6 months.

Completion date
01/10/2027

Eligibility

Key inclusion criteria
People with multiple sclerosis (MS):
1 Adults with primary progressive, secondary progressive or relapsing-remitting multiple sclerosis.
2. Expanded disability status scale score ≥4.0 and ≤6.5.
4= Significant disability, self-sufficient and up and about some 12 hours a day. Able to walk without aid or rest for 500m.
6.5= Requires two walking aids to walk about 20m without resting).

Carers or people who help look after people with MS who were involved in the study:
- This includes provision of informal or formal care, assistance with activities related to the study including attendance of hospital visits, use of the surface neuromuscular electrical stimulation device, recording of information related to healthcare visits, physical activity or exercise.

Healthcare practitioners and staff involved in the study:
- Healthcare practitioners and staff (clinical and non-clinical) who were involved in the set-up or delivery of the study.

Participant type(s)
Carer, Health professional, Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 years

Upper age limit
100 years

Sex
All

Total final enrolment
0

Key exclusion criteria
People with Multiple Sclerosis:
1. Clinically isolated syndrome.
2. People with multiple sclerosis in an active relapse or <8-weeks since a relapse.
3. Lower-limb peripheral nerve injury.
4. Fixed lower-limb contractures.
5. Contraindications to surface neuromuscular electrical stimulation i.e.
5.1. Pregnancy
5.2. Uncontrolled Epilepsy
5.3. Any of the following in the lower limbs:
i) Peripheral nerve injury
ii) Unstable fractures or orthopaedic condition affecting the lower limb
iii) Cancer (malignancy) in the areas of the electrode placement
iv) Skin infection / devitalised skin at the electrode placement site
6. Unable to apply and control surface neuromuscular electrical stimulation device or braces independently or with carer assistance.
7. Other co-morbidities that could affect mobility/additional underlying condition e.g. stroke.

Cardiac pacemaker/history of cardiac problems will not be a reason for exclusion but recruitment will be subject to cardiologist approval.

Carers of people with MS who were involved in the randomised controlled trial:
1. Carers of people who help look after people with MS but were not involved in the study will not be eligible.

Healthcare practitioners and staff involved in the study:
1. Healthcare practitioners or staff not involved in setting up or delivering the study

Date of first enrolment
03/10/2025

Date of final enrolment
03/01/2027

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
The Walton Centre NHS Foundation Trust
The Walton Centre
Lower Lane
Fazakerley
Liverpool
England
L9 7LJ

Study participating centre
The Royal Wolverhampton NHS Trust
West Park Rehabilitation Hospital
Park Road West
Wolverhampton
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WV1 4PW

Sponsor information

Organisation
University of Liverpool

ROR
https://ror.org/04xs57h96

Funder(s)

Funder type
Government

Funder Name
National Institute for Health and Care Research

Alternative Name(s)
National Institute for Health Research, NIHR Research, NIHRresearch, NIHR - National Institute for Health Research, NIHR (The National Institute for Health and Care Research), NIHR

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
The datasets analysed during the current study will be stored in a publicly available repository: https://datacat.liverpool.ac.uk/

IPD sharing plan summary
Stored in publicly available repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet	Carers version 1.1		08/07/2025	No	Yes
Participant information sheet	Easy read info version 1.1		08/07/2025	No	Yes
Participant information sheet	Healthcare professionals version 1.1		08/07/2025	No	Yes
Participant information sheet	Key facts version 1.0		08/07/2025	No	Yes
Protocol file	version 1.1	24/02/2025	16/10/2025	No	No
Protocol file	version 1.2		02/01/2026	No	No
Study website		11/11/2025	11/11/2025	No	Yes