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Assessment of electrical stimulation to improve movement for people who have Parkinson's disease

Submission date
16/06/2023

Recruitment status
No longer recruiting

Registration date
08/09/2023

Overall study status
Completed

Last Edited
29/09/2026

Condition category
Nervous System Diseases

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

Plain English summary of protocol

Background and study aims
People with Parkinson's disease (pwPD) often have difficulty walking. This causes them to move and walk slowly (bradykinesia), take small steps, freeze (involuntary stopping while walking) and they are more likely to fall. These challenges lead to a reduced quality of life and greater dependence on others. Functional Electrical Stimulation (FES) is a safe technique that applies small electrical impulses from a compact, battery-powered device through self-adhesive pads placed on the skin over the nerves that supply muscles. FES can be used to produce useful movements in underactive muscles. For example, the muscles that lift the foot can be stimulated to assist in walking. This treatment is routinely used to assist walking in people who have multiple sclerosis (MS) or have had a stroke and is a recommended treatment by NICE (National Institute for Health and Care Excellence). However, there is insufficient evidence for its use in pwPD. This research aims to determine if FES is beneficial for pwPD and if so, how it might be working in PD. In previous small studies, the study team have shown that pwPD may be able to walk faster and have reduced PD symptoms after using FES, including fewer falls and freezing episodes. Unlike with MS and stroke, pwPD experienced an improvement in walking for days, or even longer, after using FES, an effect called 'carryover' - not found in MS and stroke. Following that earlier work, a feasibility study was undertaken with 64 participants to inform the design of this larger study. The feasibility study results also suggested that FES can improve walking. Several participants reported greater confidence when walking, enabling more independence and a return to activities such as using public transport and visiting the shops. This study also showed that the FES treatment, its procedures and measurements were acceptable to pwPD. We now need to undertake a larger study to formally assess the effect of FES on walking speed. The study will also collect data to assess the wider effects of FES in pwPD to inform the need for and design of future research.

Who can participate?
pwPD aged 18 years and above

What does the study involve?
Half of the recruited participants will be randomly allocated to have FES with usual care and half

will have usual care alone. FES will be used for 18 weeks and then withdrawn for 4 weeks to determine the effect of FES and also see if any effect lasts after stopping its use. The study will measure changes in walking speed, falls, balance, PD symptoms and quality of life. A subgroup of 30 participants who receive FES will be asked to take part in interviews so that we can find out about their experiences of using FES. We will also interview partners and carers to find out their experiences.

Throughout the development of our research, we have worked with people who have PD to refine our research ideas. A Patient Advisory Group has been formed including participants from the feasibility study. This group has contributed to the design of this research and will advise on all aspects of the study. A summary of the study results will be given to the participants and offered to Parkinson's UK for their website and other PD websites. The results will be shared with the research and clinical communities through scientific publications and conference presentations. We will provide the results to NICE to enable updating of their guidelines and to clinicians who already use FES and physiotherapists working with pwPD.

What are the possible benefits and risks of participating?
Although it has not yet been proven, information from the previous small study showed that FES can improve walking speed, reduce falls, and reduce the overall impact of PD. If good evidence for these effects is produced in this study, it may lead to a new treatment being available within the NHS.

There are no known serious risks from using FES, but there are some minor ones:
1. The stimulation feels a bit like pins and needles. Most people become used to it quickly, but it is possible that the participant may find the sensation too uncomfortable and may decide not to use the device. Similarly, turning the stimulation up too high may be uncomfortable, but not dangerous. During your FES set-up visit, the clinician will determine which setting is the best for them.
2. In some cases, skin irritation from the sticky patches may occur. If this happens, the participant will be asked to contact their FES clinician. They will provide advice on how to solve the problem.
3. Some people who have epilepsy can have an increase in symptoms in response to electrical stimulation.
The ODFS Pace, the FES device used in this study, has been extensively used by people who have other neurological conditions such as Multiple Sclerosis and stroke. No serious adverse effects from using the device have been recorded.

Where is the study run from?
Salisbury District Hospital (UK)

When is the study starting and how long is it expected to run for?
March 2023 to October 2026

Who is funding the study?
National Institute for Health and Care Research (NIHR), Efficacy and Mechanism Evaluation Programme (EME) (UK)

Who is the main contact?
Abbey Tufft, abbey.tufft@plymouth.ac.uk (UK)

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Type(s)
Principal investigator

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Additional identifiers

Integrated Research Application System (IRAS)
330866

Central Portfolio Management System (CPMS)
57258

Study information

Scientific Title
The efficacy of peroneal nerve functional electrical stimulation for the reduction of bradykinesia in Parkinson’s disease: An assessor-blinded randomised controlled trial

Acronym
STEPS II

Study objectives

Daily use of functional electrical stimulation (FES) delivered to the common peroneal nerve of people who have Parkinson’s disease in addition to usual care, reduces bradykinesia, in comparison to usual care alone, demonstrated by a clinically meaningful between-group difference in walking speed (≥0.13ms-1).

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 20/09/2023, Yorkshire and the Humber- Sheffield REC (HRA Jarrow, Jarrow Business Centre, Rolling Mill Road, Jarrow, NE32 3DT, United Kingdom; +44 (0)207 104 8282; sheffield.rec@hra.nhs.uk), ref: 23/YH/0193

Primary study design
Interventional

Study design
Multi-centre two-group parallel-group-assignment assessor-blind superiority individually randomized controlled study

Study type(s)
Efficacy, Treatment

Health condition(s) or problem(s) studied
Parkinson's disease

Interventions
Functional electrical stimulation (FES)
The CE-marked ODFS Pace is a small, battery-powered, single-channel FES device used to correct dropped foot. Electrical stimulation is applied to the common peroneal nerve using skin surface self-adhesive electrodes placed over the head of the fibula and the anterior tibialis muscle.

Intervention participants will be asked to walk every day with the device and use the device whenever they feel it assists their walking. The clinical pathway established for multiple sclerosis and stroke patients will be used, with clinical (unblinded) follow-up at weeks 1, 6 and 18.

The intervention is used in addition to usual care. The control group is Usual Care. Participants will be individually randomised 1:1 to FES with usual care or usual care alone, stratified by recruiting centre to ensure approximately equal numbers of participants in the treatment and usual care-only groups at each centre. PenCTU will centrally administer the randomisation using a bespoke, web-based randomisation system. The randomisation sequence, using variable block sizes, will be generated by a statistician independent of the trial team and implemented through a secure web-based system, ensuring allocation concealment.

Intervention Type
Device

Phase
Not Applicable

Drug/device/biological/vaccine name(s)

ODFS Pace- Functional Electrical Stimulation (FES) device

Primary outcome(s)
1. Whole body bradykinesia, defined as the change in 10m walking speed (10WS)50, measured using the 10m walking test (10mWT) by a blinded assessor at baseline and 18 weeks post-baseline

Previous primary outcome:
Confirmation or otherwise of the hypothesis that FES reduces whole body bradykinesia with a clinically important effect size on walking speed at 18 weeks

Key secondary outcome(s)
1. Determine if any effects remain for up to four weeks after FES is withdrawn
2. Investigate the effect of FES on other aspects of Parkinsonian gait and living life with PD, to inform the need and design of future research. To achieve this, we will produce first estimates of the effect size of FES on secondary outcome measures for:
2.1. Hypokinesia
2.2. Akinesia
2.3. Falls and balance
2.4. Activities of daily living
2.5. Activity
2.6. Quality of Life
2.7. Cost/utility
2.8. The effect on gait while using FES
3. Determine how pwPD and their carers perceive the usefulness and practical experience of FES use and its therapeutic effect
4. Determine the safety of FES in pwPD
5. Investigate potential mechanisms of action of FES in PD, by determining:
5.1. short-term (up to 6 weeks) changes in inter-limb coordination, APA and limb bradykinesia while stepping and walking
5.2. The link between putative mechanisms of action and their relationship to walking speed at 6 and 18 weeks, through causal mediation analysis
5.3. Changes over time in the strength of muscles directly targeted and not targeted by the intervention

Completion date
31/10/2026

Eligibility

Key inclusion criteria
Current key inclusion criteria as of 21/01/2026:
1. Aged 18 years and above (no upper age limit)
2. Idiopathic Parkinson’s disease
3. Hoehn and Yahr stages I to IV under medication
4. Difficulty in walking due to Parkinson’s disease bradykinesia, defined as a measured 10m walking speed (10mWS) of less than 1.25ms-1
5. Able to walk 50m with appropriate walking aids, but without assistance from another person
6. Able to obtain standing from sitting without the assistance of another person
7. Able to understand and comply with the treatment and assessment procedures
8. Able to give informed consent

Previous participant inclusion criteria as of 13/10/2023:
1. Aged 18 years and above (no upper age limit)
2. Idiopathic Parkinson’s disease
3. Hoehn and Yahr stages I to IV under medication
4. Difficulty in walking due to Parkinson’s disease bradykinesia, defined as a measured 10m walking speed (10mWS) of less than 1.25ms-1
5. Able to walk 10m with appropriate walking aids, but without assistance from another person
6. Able to obtain standing from sitting without the assistance of another person
7. Able to understand and comply with the treatment and assessment procedures
8. Able to give informed consent

Previous participant inclusion criteria:
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4. Difficulty in walking due to Parkinson’s disease bradykinesia, defined as a measured 10m walking speed (10mWS) of less than 1.25ms-1
5. Able to walk 10m with appropriate walking aids, but without assistance from another person
6. Able to obtain standing from sitting without the assistance of another person
7. Medically stable, defined as no significant changes in the participant’s condition over the last 3 months
8. Able to understand and comply with the treatment and assessment procedures
9. Able to give informed consent

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 Years

Upper age limit
110 Years

Sex
All

Total final enrolment
0

Key exclusion criteria
Current key exclusion criteria as of 21/01/2026:
1. Receiving, or scheduled to start, deep brain stimulation, within the next 6 months
2. Receiving or scheduled to start apomorphine, duodopa or produodopa within the next 6 months (those who are currently taking duodopa and apomorphine are eligible)

3. Pyramidal and/or extrapyramidal systems injuries
4. Untreated or refractory epilepsy with seizures in the last 3 months
5. Pregnancy or planned pregnancy
6. Cardiac pacemaker, or other active medical implanted devices
7. Denervation of the common peroneal nerve, or other neurological condition known to cause dropped foot
8. Severe osteoarticular pathology that involves the calf bones, knee and tibiotarsal joints, or other conditions that significantly affect walking
9. Malignancy or dermatological conditions in the leg that would be stimulated
10. Major cognitive impairment; dementia under treatment for an unresolved deep vein thrombosis in the leg that would be stimulated
11. Participating in another interventional clinical trial (observational studies are permitted)

Previous participant exclusion criteria as of 13/10/2023:
1. Receiving, or scheduled to start, deep brain stimulation, within the next 6 months
2. Receiving or scheduled to start apomorphine or duodopa within the next 6 months (those who are currently taking duodopa and apomorphine are eligible)
3. Pyramidal and/or extrapyramidal systems injuries
4. Untreated or refractory epilepsy with seizures in the last 3 months
5. Pregnancy or planned pregnancy
6. Cardiac pacemaker, or other active medical implanted devices
7. Denervation of the common peroneal nerve, or other neurological condition known to cause dropped foot
8. Severe osteoarticular pathology that involves the calf bones, knee and tibiotarsal joints, or other conditions that significantly affect walking
9. Malignancy or dermatological conditions in the leg that would be stimulated
10. Major cognitive impairment; dementia under treatment for an unresolved deep vein thrombosis in the leg that would be stimulated
11. Participating in another interventional clinical trial (observational studies are permitted)

Previous participant exclusion criteria:
1. Able to walk 10m in less than 8.0s (walking speed greater than 1.25ms-1)
2. On, or scheduled to start, PD treatment other than standard drug therapy (deep brain stimulation, duodopa, apomorphine)
3. Atypical or secondary parkinsonism, or parkinsonism related to other neurodegenerative diseases
4. Pyramidal and/or extrapyramidal systems injuries
5. Untreated or refractory epilepsy with seizures in the last 3 months
6. Pregnancy or planned pregnancy
7. Cardiac pacemaker, or other active medical implanted devices
8. Denervation of the common peroneal nerve, or other neurological condition known to cause dropped foot
9. Severe osteoarticular pathology that involves the calf bones, knee and tibiotarsal joints, or other conditions that significantly affect walking
10. Malignancy or dermatological conditions in the leg that would be stimulated

Date of first enrolment
01/10/2023

Date of final enrolment
31/05/2026

Locations

Countries of recruitment
United Kingdom

England

Wales

Study participating centre
Salisbury District Hospital
Salisbury District Hospital
Odstock Road
Salisbury
England
SP2 8BJ

Study participating centre
Swansea Bay University Local Health Board
One Talbot Gateway, Seaway Drive
Seaway Parade Industrial Estate
Baglan
Port Talbot
Wales
SA12 7BR

Study participating centre
Leeds Teaching Hospitals NHS Trust
St. James's University Hospital
Beckett Street
Leeds
England
LS9 7TF

Study participating centre
Salisbury District Hospital
Odstock Road
Salisbury
England
SP2 8BJ

Study participating centre
Morriston Hospital
Rehabilitation Engineering Unit
Swansea
Wales
SA6 6NL

Study participating centre
Chapel Allerton Hospital
Chapeltown Road
Leeds
England
LS7 4SA

Study participating centre
Moseley Hall Hospital
Alcester Road
Moseley
Birmingham
England
B13 8JL

Study participating centre
Glan Clwd Hospital
Ysbyty Glan Clwydd
Bodelwyddan
Rhyl
England
LL18 5UJ

Study participating centre
Wigton Hospital
Cross Lane
Wigton
England
CA7 9DD

Study participating centre
Florence Nightingale Community Hospital
London Road
Derby

England
DE1 2QY

Study participating centre
Ipswich Hospital
Heath Road
Ipswich
England
IP4 5PD

Sponsor information

Organisation
Salisbury NHS Foundation Trust

ROR
https://ror.org/00ja2ye75

Funder(s)

Funder type
Government

Funder Name
Efficacy and Mechanism Evaluation Programme

Alternative Name(s)
NIHR Efficacy and Mechanism Evaluation Programme, Efficacy and Mechanism Evaluation (EME), EME

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and analysed during the current study will be available upon request from the Chief Investigator and Sponsor (Salisbury NHS Foundation Trust). The data arising from the trial will be owned by the Sponsor. On completion of the trial, the data will be analysed and tabulated and a Final Trial Report prepared. This report will be submitted to the Trial Sponsor and Funder and will be publicly available. Participating investigators will not have the right to publish any of the trial data without the permission of the CI and Sponsor.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		05/09/2025	09/09/2025	Yes	No
Participant information sheet	Detailed version 1.1	13/09/2023	25/09/2023	No	Yes
Participant information sheet	Summary version 1	11/07/2023	25/09/2023	No	Yes
Participant information sheet	version 1.5	21/10/2024	21/01/2026	No	Yes
Participant information sheet	version 1.3	21/10/2024	21/01/2026	No	Yes
Protocol file	version 1.1	13/09/2023	25/09/2023	No	No
Protocol file	version 2.1	22/10/2025	21/01/2026	No	No
Protocol file	version 3	21/08/2026	29/09/2026	No	No
Statistical Analysis Plan	version 1.0	20/08/2026	29/09/2026	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes