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Online arm-crank exercise programme for people with spinal cord injury (SCI)

Submission date
12/06/2026

Recruitment status
Not yet recruiting

Registration date
16/06/2026

Overall study status
Ongoing

Last Edited
16/06/2026

Condition category
Nervous System Diseases

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

Plain English summary of protocol
Background and study aims
This research is about testing a home-based exercise programme designed to help people with spinal cord injury (SCI) stay healthy and reduce the risk of future health problems.

The programme uses Arm-Crank Exercise (ACE), where participants sit and use their arms to turn the handles of a stationary arm bike, similar to leg cycling but using your arms. Each session follows a routine and aims to improve fitness, mobility, and general wellbeing in people with SCI.

This research will test whether an online ACE programme is practical to deliver, acceptable to participants, and potentially suitable for use in the NHS. The research is carried out in people's homes.

Who can participate?
We will invite 50 people with long-term SCI who cannot walk unaided to take part. Participants will be recruited through NHS spinal clinics and charities.

What does the study involve?
The 12-week programme will include three group sessions per week, delivered live via Zoom. Participants can also use recorded sessions if they prefer more flexibility.
We will monitor how many people take part, how many complete the programme, and how often they join sessions. Participants will track their effort using a heart rate monitor and report any fatigue or shoulder pain every two weeks. Any issues or side effects will be recorded.
At the end of the programme, participants will be invited to complete a short survey and join a group discussion about their experience and how the programme could be improved. Their feedback will help us plan a larger study in the future.

What are the possible benefits and risks of participating?
After the programme, we expect that participants may improve fitness, physical function, such as strength of the upper body, seated balance, and mental health.

Where is the study run from?
University of Birmingham (UK)

When is the study starting and how long is it expected to run for?
August 2026 to April 2028

Who is funding the study?
National Institute for Health and Care Research (NIHR) (UK).

Who is the main contact?
arm-crank-study@contacts.bham.ac.uk

Read the study information sheet and express your interest in participation here: https://itm-redcap.bham.ac.uk/surveys/?s=KTRMACLT7KAPF9EM

Contact information

Type(s)
Principal investigator, Scientific, Public

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Additional identifiers

Central Portfolio Management System (CPMS)
69526

National Institute for Health and Care Research (NIHR)
209820

Study information

Scientific Title
Feasibility and acceptability of a home-based arm-crank exercise programme for people living with spinal cord injury

Acronym
Arm-Crank SCI

Study objectives
1. Is a 12-week online home-based ACE programme, delivered three times a week, acceptable for people with SCI?
2. Is the ACE programme safe to be undertaken by people with SCI at home?
3. Is the ACE programme feasible, with potential to be integrated in the NHS SCI care pathways?

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 22/05/2026, West of Scotland REC 5 (Suite 203, The Pentagon Centre36 Washington Street, Glasgow, G3 8AZ, United Kingdom; no telephone number provided; ggc.wosrec5@nhs.scot), ref: 26/WS/0045

Primary study design
Interventional

Allocation
Non-randomized controlled trial

Masking
Open (masking not used)

Control
Uncontrolled

Assignment
Single

Purpose
Treatment

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Spinal cord injury

Interventions
This is a prospective, non-randomised, single-arm feasibility study, informed by prior research, PPIE input, and the multidisciplinary expertise of the study team. The study will evaluate the feasibility of delivering the intervention and levels of participant engagement in 50 individuals with SCI. We will also conduct qualitative interviews and focus groups with participants, individuals excluded due to language or digital barriers, and healthcare professionals to explore the intervention’s acceptability, safety, and practical considerations for future NHS implementation

Work package 1. Feasibility study

Planned intervention: Home-based ACE programme
The proposed intervention is a structured 12-week ACE programme delivered remotely in the

participant's home. After reviewing best practice guidelines highlighted in relevant literature and discussing with our PPIE groups what would be an appropriate commitment for the programme, the intervention volume was set to 30 minutes per day, 3 days per week, for 12 weeks. The programme duration was determined to be in line with a typical community-based exercise programme for health in individuals with SCI. This dose and duration of the intervention allows time for participants to engage in an evidence-based intervention, progress, and see improvement

Equipment provision and induction session
To support safe and effective participation, all participants will be provided with:
1. A portable arm ergometer (MagneTrainer ER) and an anti-slip mat
2. A chest-worn heart rate HR monitor (Polar H10), a widely used device for monitoring HR in SCI exercise interventions
3. Gripping aids, if needed

Each participant will receive a personalised induction session of approximately 45 minutes delivered via Zoom, or in person either in clinic or via a home visit, depending on individual needs and preferences. This session will cover:
1. Introduction to the aims and expectations of the programme
2. Safe setup and positioning of the arm ergometer
3. Instructions for joining Zoom sessions, camera and sound setup, and using the HR monitor with the Polar Beat app. The research team will help participants set up the Polar Beat app if needed. A project-dedicated account will be created for each participant so that there is no identifiable data going to the app developer
4. A supervised one-to-one ACE trial of approximately 20 minutes to confirm correct technique and screen for any safety concerns
5. Agreement of a personalised weekly schedule, considering the participant's availability and needs

Exercise class format and delivery
The research fellow appointed in this study will have the relevant qualification, for example a bachelor's degree in physiotherapy or sports, exercise and health sciences, and be trained to deliver the intervention safely and effectively

Participants will join three live group sessions per week via Zoom for 12 weeks. Each class will follow a standardised structure:
1. 5 minutes pre-session setup and check-in
2. 5 minutes warm-up
3. 30 minutes main ACE session using an interval training format, alternating moderate to vigorous intensity arm cycling with recovery periods. Research suggests that interval training elicits higher enjoyment versus moderate exercise in individuals with SCI
4. 5 minutes cool-down and stretches

Live classes will be scheduled at set times, with sessions opening 15 minutes before and remaining open 15 minutes after for optional peer interaction and support. Breakout rooms will be used for people who prefer socialising in a smaller group. This structure is informed by evidence that social support enhances exercise adherence

Participants who are unable to attend a live session will have the option to access the pre-recorded session. Attendance will be tracked through a study-provided exercise diary

To ensure effective monitoring, group sizes will be limited so that the trainer can observe all participants on screen and offer real-time guidance. Participants will be advised to have a family member, carer, or companion present or nearby during the sessions for added safety

Monitoring intensity, safety and adherence
Exercise intensity will be monitored as per recommendations for delivering and evaluating exercise interventions involving people with SCI using:
1. Heart rate, recorded via Polar H10 and synced to the Polar Beat app
2. Participant-rated perceived exertion RPE logged at each session

Participants will be trained during induction to record and share HR data. RPE will be logged in an exercise diary. Data from HR monitors and RPE scores will be documented by participants in the exercise diary

Safety monitoring will include:
1. Biweekly REDCap online surveys of approximately 10 minutes assessing fatigue using the Fatigue Severity Scale and shoulder pain using the Wheelchair User's Shoulder Pain Index
2. Self-reported logs of adverse events
3. Telephone check-ins by the research team every two weeks to identify any safety concerns or non-engagement

Work package 2. Qualitative interviews and focus groups
1. Focus groups with study participants. Four online focus groups of approximately 60 minutes each with a total of 20 participants, five per group, who have completed the programme will be conducted. Participants will be purposively sampled to review adherence and access and inclusivity. Where possible, appropriate representation across sex, ethnicity and socio-economic status will be ensured
2. Focus groups with healthcare professionals. Two online focus groups with a total of 10 healthcare professionals representative of SCI care pathways in England will be conducted via videoconferencing. Healthcare professionals working in spinal units where study participants are outpatients will be invited. Clinicians and physiotherapists involved in this study will also be invited to take part
3. Focus group schedule. Focus groups will provide in-depth insights into participants' views on the feasibility, acceptability and safety of the intervention. Discussions will explore perceived effectiveness, strengths and challenges related to implementation, and any adaptations needed to support engagement, delivery and overall impact

Intervention Type
Behavioural

Primary outcome(s)
1. Participation rate measured using recruitment logs documenting number of participants recruited per month from NHS sites and community sources, supplemented where feasible by logs of individuals declining participation and qualitative feedback from focus groups at continuously during the recruitment period

2. Adherence to the intervention measured using number of completed sessions versus prescribed sessions recorded via class attendance logs and participant exercise diary, expressed as a percentage of total sessions offered at throughout the 12 week intervention period

3. Safety, including fatigue, shoulder pain, and adverse events measured using Fatigue Severity Scale, Wheelchair User's Shoulder Pain Index, and self reported adverse events collected via

participant report during biweekly telephone calls at baseline, every 2 weeks during the 12 week intervention, and end of intervention at 12 weeks

4. Attrition measured using study withdrawal records and completeness of follow up data from study database at assessed at end of intervention at 12 weeks and at any point of withdrawal during the study

5. Usability, perceived effectiveness and satisfaction measured using a self-reported online EXIT survey at 12 weeks

Key secondary outcome(s)
1. Functional capacity and cardiovascular fitness measured using Six-Minute Arm-Crank test (6-MAT) with recording of rating of perceived exertion RPE, heart rate HR and distance via arm ergometer and remote supervision at baseline, 12 weeks

2. Health-related quality of life across physical and mental health domains measured using Short Form 36 walk-wheel questionnaire (a modified version for SCI) at baseline, 12 weeks

3. Health-related quality of life and health utilities measured using EQ-5D-5L and SF-6D questionnaires with comparative analysis alongside SF-36 walk-wheel outputs at baseline, 12 weeks

4. Health care resource use measured using ModRUM questionnaire for self-reported resource use and Case Report Form for extraction of resource use data from NHS records at baseline, 12 weeks

5. Waist circumference measured using self-measured waist circumference in the supine position using a measuring tape by a carer or family member under remote supervision at baseline, 12 weeks

6. Bowel function measured using International Spinal Cord Injury Bowel Function Basic Data Set questionnaire at baseline, 12 weeks

7. Leisure time physical activity level measured using leisure time physical activity questionnaire at baseline, 12 weeks

Completion date
30/04/2028

Eligibility

Key inclusion criteria
1. Aged 16 years and older
2. Diagnosed with cervical, thoracic, or lumbar SCI, and medically stable
3. Can provide informed consent and understand and follow instructions for assessment and intervention
4. Use a wheelchair for >=75% of their waking hours
5. Have sufficient elbow flexors strength to operate an arm-crank ergometer
6. Have access to a device and internet connection capable of running Zoom

Due to the scope of this study being a feasibility study, the instructions will be given in English. We are aware of the translation services available in the NHS and will consider this for a future trial for the study to be fully inclusive.

Additionally, the inclusion criteria for recruiting stakeholders to the qualitative focus group study are:
1. Aged 18 years and above
2. Qualified specialists for caring patients with spinal cord injury in the NHS SCI care pathways
3. At least 6 months experience in caring for people with SCI

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
16 years

Upper age limit
120 years

Sex
All

Total final enrolment
0

Key exclusion criteria
1. Presence of unstable or acute medical conditions that are contraindications for exercise
2. Clinical advice against unsupervised exercise from a consultant or physiotherapist
3. Participation in another research study targeting rehabilitation or health management

Date of first enrolment
01/08/2026

Date of final enrolment
31/07/2027

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
University of Birmingham
School of Sport, Exercise and Rehabilitation Sciences

Edgbaston
Birmingham
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B15 2TT

Study participating centre
Sheffield Teaching Hospitals NHS Foundation Trust
Northern General Hospital
Herries Road
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Study participating centre
Stoke Mandeville Hospital
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HP21 8AL

Sponsor information

Organisation
University of Birmingham

ROR
https://ror.org/03angcq70

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 generated during and/or analysed during the current study are/will be available upon request from (Dr Chloe Chiou, s.chiou@bham.ac.uk, anonymous data may be shared with other research groups for research use only after the full results are published. The data will be available for 10 years. Data are available upon reasonable requests directly to Dr Chiou.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Other files	Flyer version 1		16/06/2026	No	No