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# Brain training app for cognition in people with long COVID (BEACON)

**Submission date**
25/08/2023

**Recruitment status**
No longer recruiting

**Registration date**
14/09/2023

**Overall study status**
Completed

**Last Edited**
03/04/2024

**Condition category**
Infections and Infestations

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

## Plain English summary of protocol

Background and study aims
The most concerning legacy of the Covid-19 pandemic is long COVID which affects at least 9.9% of people. About 25% of people with long COVID experience problems with their brain health, such as memory problems. These symptoms could stop people getting back to work and socialising and could increase their risk of dementia later in life. There is a need for a low-cost, effective treatment that can be rolled out on a large scale. Brain training offers a means to address this and digital delivery is a pragmatic way of delivering it.
The Reasoning Cognitive Training (ReaCT) brain training programme is available online and is known to help maintain brain health in older adults, but has not yet been tested in people with long COVID. This study aims to establish the effectiveness and cost-effectiveness of the ReaCT brain training programme in adults with cognitive impairment following Covid-19.

Who can participate?
inclusion criteria include
• Age 18 and over.
• Self-reported Covid-19 infection (based on previous positive PCT/LFT test, laboratory /hospital diagnosis or suspected infection).
• Subjective Cognitive Impairment (based on self-report, supported by capture of symptoms and impacts).
• Access to a smartphone, tablet, or computer with an internet connection.
• Good understanding of the English Language, sufficient to participate.
*This study will be open to all to ensure diversity.

What does the study involve?
If you decide to take part the following steps will take place:
1. You will be directed to the next section of the app or website where all instructions, assessments and study information can be found.
2. You will be asked to complete a checklist to confirm your eligibility. This will include completing a short questionnaire to confirm your Covid-19 history and concerns about your brain function.
3. Provided you are eligible, you will be asked to register with the BEACON study and confirm that you have read this Participant Information Sheet. A downloadable copy of this is available

on the app and website <insert URL>.
4. You will be asked to read and agree your consent via the app or the website to ensure you understand what the study involves and that you are happy to participate in the study.
5. You will then be asked to complete your first study assessment. The assessments will be completed online on the app or website and will be:
a. A set of tests to measure brain function (called a cognitive test battery), which need to be completed in full. If possible, we ask that you complete the set of tests two times in the first week. This gives you a chance to learn how to do them and helps us collect the best possible data. You need to complete the set of tests at least once to unlock the next assessments.
b. We will also ask you to rate your own brain function.
c. A Quality of Life questionnaire to measure your overall health on the day you take the tests.
d. An Everyday Activities questionnaire to measure how you are as you go about your day-to-day activities.
e. A Mood questionnaire that includes questions about your mental health including anxiety and depression.
f. A Sleep questionnaire that includes questions about how tired you feel and how you are sleeping.
g. A Service User questionnaire that asks about any health services you have used recently, such as GP surgeries, hospitals, and pharmacies.
h. An Everyday Emotions questionnaire to measure your day-to-day behaviour.
6. You will be asked to nominate a study partner to take part in the study. This is optional. The study partner should be someone you know well and who you see regularly. They will be asked to complete a questionnaire about you at the beginning of the study, six weeks later, and after six months.
7. Once you have finished your first set of assessments, you will be randomly assigned to play the ReaCT brain training games or a placebo (dummy) set of games. The placebo games are like the brain training games, but do not have the same learning effects as the ReaCT games. There will be a 50:50 chance of receiving either ReaCT or placebo and neither you nor the research team will know which set of games are assigned to you to play.
8. You can then start playing the games as often as you wish. We ask that you log in and play the games for at least ten minutes, three times a week. You will receive notifications and emails to help you remember to play the games, and the games will show your score so you can track your progress.
9. You will be asked to complete the same set of tests as mentioned above after six weeks, and after six months from the time you did the first set of tests. The cognitive test battery only needs to be completed once at these times. We will send you an email reminder when your assessments are ready to do and if you are taking part through the app you will receive notifications as well.
10. We would like to have a record of any ill health you experience during the course of the study. You will be asked to answer an optional set of simple questions related to your health when you log into the app or website. This should take about 3-5 minutes depending on your answer. If you report a serious health problem, we may contact you and / or your General Practitioner, with your permission, for more information. We also recommend that if you experience any ill health you contact your usual healthcare provider (usually your GP) for advice.
11. At the end of the study, we will ask you to complete a survey and provide us with suggestions and feedback on your experience from the study. We will also make the findings of the research available through the study website, app and a newsletter.
12. We will be able to tell you which set of games (ReaCT or placebo) you played after all participants have completed the study and the data has been analysed.

All the information we collect will be secure and confidential. Analysis will be completed using anonymous data. We will keep your personal data in case we need to contact you, but this will be for no more than 10 years after the study has finished and then it will be securely destroyed.

What are the possible benefits and risks of participating?
By taking part in this study, it could help move forward our understanding of long COVID and how it should be treated and supported. In addition to the potential benefit to brain health, our previous research in this field shows that playing the brain training games is fun and engaging, and people report enjoying being a part of a large study into an important topic. We are unable to guarantee that you will have the same benefit to your brain health because 50% of participants will play in the ReaCT games and the other 50% of participants will play the placebo games. Neither you nor the study team will know whether you are playing ReaCT or the placebo games, but we hope you will enjoy playing the games and contributing valuable information for our research.

There are no known risks associated with playing the ReaCT brain training games. However, excessive use of the games could lead to fatigue and stress, so we recommend taking regular breaks and playing the games for ten to fifteen minutes each time.

This study does not replace National Health Services and if you feel less well during the time you are part of this study it is important that you seek help from your doctor or local health professionals in the usual way.

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

When is the study starting and how long is it expected to run for?
January 2023 to March 2025

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

Who is the main contact?
BEACON study team, BEACON@exeter.ac.uk

### Study website
https://www.beaconstudy.org.uk

# Contact information

### Type(s)
Principal Investigator

### Contact name
Prof Anne Corbett

### ORCID ID
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### Contact details

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# Additional identifiers

### EudraCT/CTIS number
Nil known

### IRAS number
327021

### ClinicalTrials.gov number
Nil known

### Secondary identifying numbers
CPMS 57359, NIHR203603, IRAS 327021

# Study information

### Scientific Title
Online brain training for people with cognitive impairment following SARS-CoV-2 infection: A randomised controlled clinical trial

### Acronym
BEACON

### Study objectives
What is the impact of the ReaCT programme on executive function as measured using the verbal reasoning task in two groups of adults aged (over 40, and over 18), with post-acute sequelae of SARS-CoV-2 infection (PASC)?

### Ethics approval required
Ethics approval required

### Ethics approval(s)
Approved 01/08/2023, North West - Greater Manchester South Research Ethics Committee (3rd Floor, Barlow House, 4 Minshull Street, Manchester, M1 3DZ, United Kingdom; +44 207 104 8014; gmsouth.rec@hra.nhs.uk), ref: 23/NW/0215

### Study design
Two-arm placebo-controlled double-blind randomised controlled trial

### Primary study design

Interventional

## Secondary study design
Randomised controlled trial

## Study setting(s)
Internet/virtual

## Study type(s)
Other

## Participant information sheet
Not available in web format, please use the contact details to request a patient information sheet.

## Health condition(s) or problem(s) studied
Long COVID

## Interventions
1. Recruitment: Participants will be identified through primary care settings, by email through affiliated cohorts (UK PROTECT study and Covid Symptom Study Biobank), publicity and social media. All potential participants will be signposted to either a dedicated web page with information about how to access the trial or directly to the app store on their smartphone to download the BEACON study app and register for the trial.
2. Registration, Eligibility Screening and Consent: The app and website will both present the Participant Information Sheet Consent for online reading or download. Screening for eligibility will be conducted through the app and consent will be electronically recorded using an established, ethically approved process. Participants will also have the option of nominating a study partner who will complete assessments about them at each timepoint.
3. Baseline Assessment: Following consent, participants will navigate to their study dashboard where they will follow a prescribed, scheduled assessment process for the baseline timepoint. This will include the following assessments in sequence:
a. Cognitive Test Battery: A series of eight computerised cognitive tests (called FLAME) that assess key cognitive domains of executive function, working memory, episodic memory, attention and reaction time/processing speed.
Each test session lasts around 30 minutes depending on speed of performance. At baseline participants will be asked to complete the test battery in triplicate over a seven day period, with a minimum of two replicates. Once two sessions have been completed all other assessments (described below) will be available for completion
b. Subjective cognitive impairment: Two questionnaires to capture the participants' self-report of their cognitive status and performance
c. Mental health: Two questionnaires to capture anxiety and depression
d. Quality of life and wellbeing: One questionnaire that captures participant wellbeing
e. Day-to-day function: Two questionnaires that capture participants' day-to-day functional abilities, one focussing on general activity and one on Covid-related symptoms and functions
f. Fatigue: Two questionnaires that capture sleep quality and day-to-day fatigue
g. Covid-19 status and history: One questionnaire that will capture participants' history of infection, symptoms and vaccination for Covid-19
h. Service use: One questionnaire that captures use of key services

Randomisation and intervention:
Following baseline completion participants will be randomly allocated to either the ReaCT programme or the control programme. They will access the programmes from their app / website dashboard. The ReaCT programme involves three tasks focusing on reasoning skills – one in which weights must be balanced on a seesaw, one which involves identifying the 'odd one out' in a series of shapes and one involving strategic positioning of crates in a pile; and three focusing on planning skills – one involving plotting a line around a grid to avoid crossing over the line, one in which objects are moved between 'jars' to match a pattern, and one in which numbered tiles must be moved around a grid to position them in numerical order.

The control package will involve a package of simple training style tasks that do not have any learning effects.
Participants will be encouraged to log on and complete one training session of ten minutes at least three times per week. They will receive email and push notifications to encourage them to log in, and will be presented with new options from within the programme of games each time they log in. To support engagement, participants in both trial arms will also be provided with game scores, motivational messages and awards for game play.

Six-week and six-month assessment:
At the six-week and six-month timepoints participants will receive an email, SMS and push notification reminding them to log in and complete their assessment battery. This process will be identical to the baseline assessment process with the exception of the following:
a. Cognitive tests: Only one cognitive test session will be required instead of three. To avoid contamination of the cognitive test data participants will be required to complete their cognitive test session prior to any other assessment or intervention.
b. The Covid-19 history questionnaire will not be included, but participants will be asked to report any new Covid-19 infections.
c. Employment / volunteering activity: Participants will be asked to report any changes to their employment or volunteering activity since the previous timepoint.

Safety Monitoring: Throughout the study participants will have access to an adverse event capture questionnaire which will be continuously scheduled and available, and will be visible on the dashboard. Participants will complete a form to report any adverse event (AE) to enable capture of AE and Serious Adverse Events (SAE). If an SAE is reported participants may be contacted to provide further detail to enable review and reporting by the study team.

End of Study:
At the end of the study participants will be thanked for their contribution to the research and will receive a report of the findings once the analysis is complete. After completion of the final assessment participants in both intervention groups will be provided with ongoing access to the ReaCT programme through the app.

STUDY PARTNER JOURNEY
Recruitment: Study partners will be nominated by participants during registration using their email address. Study Partners will receive an email with a link to join the study, either via an app download or the study website.

Registration and consent: The study partners will follow the same consent journey as the participants

Baseline, 6-week and 6-month assessments: Study partners will receive an email, SMS and/or notification when assessments are due for completion. They will log onto the study app or

website and complete two informant-reported questionnaires:
a. Study Partner IQCode: A brief questionnaire about the participants' cognitive abilities
b. Study Partner IADL: A brief questionnaire about the participants' abilities to perform day-to-day tasks.

End of Study: Study Partners will receive a report at the end of the study as described above.

### Intervention Type
Behavioural

### Primary outcome measure
Executive function measured using the well-validated verbal reasoning task at 6 weeks and 6 months

### Secondary outcome measures
Measured at baseline, 6 weeks and at 6 months:
1. Cognition measured using the FLAME cognitive test battery
2. Self-reported and Informant cognition measured by the IQCODE
3. Subjective cognitive impairment measured by the 24-item Subjective Cognitive Decline Questionnaire
4. Quality of life measured by the EQ5D measure with EQ-VAS
5. Instrumental Activities of Daily Living measured by a modified self and informant reported six-item IADL, based on the previous ReaCT trial, the Post-COVID Functional Status (PCFS) scale and the Washington Group Short Set on Functioning (WG-SS).
6. Symptoms of mood and depression, measured by the nine-item Patient Health Questionnaire (PHQ-9).
7. Symptoms of anxiety, measured by the seven-item Generalised Anxiety Disorder (GAD-7) scale.
8. Experience of fatigue measured by the Functional Assessment of Chronic Illness Therapy – Fatigue (FACIT) scale27. An additional question will capture the approximate time of day participants experience fatigue.
9. Sleep quality measured by the short-form Cognition Online Sleep Monitoring Scale (COSMOS)
10. Health care and personal social care service usage will be captured using a modified version of the Client Service Receipt Inventory (CSRI) 28 to enable health economics analysis.
11. Within the CSRI, participants will be asked to provide brief details about their employment activity to support the health economic analysis and to capture changes in their employment activity post-COVID infection.

### Overall study start date
01/01/2023

### Completion date
30/03/2025

## Eligibility

### Key inclusion criteria
1. Age 18 and over
2. Self-reported Covid-19 infection (based on previous positive PCT/LFT test, laboratory /hospital diagnosis or suspected infection)
3. Subjective Cognitive Impairment (based on self-report, supported by capture of symptoms and impacts)

4. Access to a smartphone, tablet or computer with an internet connection.
5. Ability to understand the English language sufficiently well to take part.

### Participant type(s)
Patient

### Age group
Adult

### Lower age limit
18 Years

### Sex
Both

### Target number of participants
Planned Sample Size: 1,608; UK Sample Size: 1,608

### Key exclusion criteria
1. Already taking part in another active interventional clinical trial
2. Having accessed the ReaCT programme online through participation in the PROTECT UK ageing cohort over the last 12 months
3. Diagnosis of dementia

### Date of first enrolment
06/03/2024

### Date of final enrolment
30/08/2024

## Locations

### Countries of recruitment
England

United Kingdom

### Study participating centre
**Royal Devon University Healthcare NHS Foundation Trust**
Royal Devon University NHS Ft
Barrack Road
Exeter
United Kingdom
EX2 5DW

## Sponsor information

### Organisation
University of Exeter

### Sponsor details
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### Sponsor type
University/education

### Website
http://www.exeter.ac.uk/

### ROR
https://ror.org/03yghzc09

## Funder(s)

### Funder type
Government

### Funder Name
NIHR Central Commissioning Facility (CCF)

## Results and Publications

### Publication and dissemination plan
Planned publication in a high-impact peer-reviewed journal

### Intention to publish date
30/04/2026

### Individual participant data (IPD) sharing plan
The current data sharing plans for this study are unknown and will be available at a later date

### IPD sharing plan summary
Data sharing statement to be made available at a later date