

# A smartphone app to measure day-to-day changes in hand symptoms

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<b>Registration date</b> 17/02/2022	<b>Overall study status</b> Completed	<input type="checkbox"/> Statistical analysis plan <input checked="" type="checkbox"/> Results
<b>Last Edited</b> 15/09/2023	<b>Condition category</b> Surgery	<input type="checkbox"/> Individual participant data

## Plain English summary of protocol

### Background and study aims

Patient-reported outcome measures (PROMs) are questionnaires that measure important elements of health. In hand surgery, PROMs are used to measure health constructs such as pain and hand function. This can be important in clinical practice, to tell whether an intervention (e.g. an operation or hand therapy) has made somebody feel better, or in research to compare how effective different interventions are. A problem with PROMs is that we usually only ask patients to complete them at infrequent and arbitrary time points (e.g. before surgery, at 6 weeks and again at 3 months). This means that day-to-day changes in symptoms are often missed. This is particularly important in arthritis and hand injuries, where symptoms can be brought on by certain activities, and even affected by the weather.

We plan to test a new technique to collect PROM responses more frequently. It is called Ecological Momentary Computerised Adaptive Testing (EMCAT). EMCAT works by using “artificial intelligence” to make PROM questionnaires much shorter and tailored to an individual, based on their previous responses. By making PROMs shorter, we think that people could complete them at frequent time points (e.g. every day) by using a smartphone application. This will help us capture day-to-day changes in symptom severity.

### Who can participate?

People who have had a hand injury, and people who have hand arthritis

### What does the study involve?

We are going to test a smartphone application that uses EMCAT. To see if people like using it, we will check how frequently they used it and interview them about their experience. This information will help us to make the application better, so that we can test it in a large-scale study at a later date.

### What are the possible benefits and risks of participating?

There are no significant risks to taking part in this study and no direct benefits to participants, but this work may go on to help patients with a range of conditions in the future.

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

When is the study starting and how long is it expected to run for?  
September 2020 to December 2022

Who is funding the study?  
The British Society for Surgery of the Hand, the Federation of European Societies for Surgery of the Hand, and AOUK

Who is the main contact?  
Conrad Harrison, conrad.harrison@medsci.ox.ac.uk

## Contact information

**Type(s)**  
Scientific

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## Additional identifiers

**Integrated Research Application System (IRAS)**  
302403

**Central Portfolio Management System (CPMS)**  
51091

## Study information

**Scientific Title**  
The feasibility of ecological momentary computerised adaptive testing in hand surgery

**Study objectives**

The aim is to test Ecological Momentary Computerised Adaptive Testing (EMCAT) to take Patient-reported outcome measures (PROMs) more frequently.

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

Approved 19/12/2021, East of England - Cambridge East Research Ethics Committee (The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS, UK; +44 207 1048375; CambridgeEast.REC@hra.nhs.uk), ref: 21/EE/0261

### **Study design**

Observational case series

### **Primary study design**

Observational

### **Study type(s)**

Treatment

### **Health condition(s) or problem(s) studied**

Hand surgery

### **Interventions**

We will perform a mixed-methods pilot study of the PEM EMCAT platform. This will involve 40 participants engaging with the EMCAT app on their smartphones over a 12 week period. Following this, semi-structured interviews will be conducted with a maximum diversity sample of 10 participants. These will be recorded for thematic analysis. Engagement rates will be quantified for the whole sample of 40 participants.

### **Sampling Strategy**

Initially, we will purposively select a maximum diversity sample of 20 participants undergoing treatment for thumbbase OA and 20 participants undergoing treatment for hand trauma. These participants will be recruited from Buckinghamshire NHS Trust and the Cardiff and Vale University Health Board. We will aim to diversify samples by age, sex, ethnicity, employment status, hand dominance and type of treatment.

From each group, 5 participants will be purposefully sampled for semi-structured qualitative interviewing. We will aim to diversify these subgroups by the same variables.

### **Methods of Data Collection**

Each of the 40 participants will be asked to download the EMCAT web-browser app onto their smartphones and enable push notifications. Where required, a member of the research team will assist with this. At pre-specified time schedules, participants will be sent a reminder to engage with the app via email and/or push notification. Three different time schedules will be tested: three notifications a day, one notification a day, and three notifications a week.

When a participant receives a notification, they can choose to engage with the EMCAT app, or dismiss the notification. If the participant chooses to open the EMCAT app, they will be invited to complete a sample of items from the PEM part 2. We expect that participants will be asked to complete between 1 and 4 questions each time they are notified. PEM EMCAT responses will be collected for a period of 12 weeks.

In addition to the PEM EMCAT, each participant will be asked to complete the full-length PEM part 2 questionnaire (11 items) at 0, 6 and 12 weeks via the app. At 12 weeks, we will also ask participants to complete the 31 item User Engagement Scale (UES), also via the app.

Following the 12 week pilot period, we will select a maximum diversity sample of 5 participants with thumb-base OA and 5 participants with hand trauma for qualitative interviews. Semi-structured interviews will be conducted, and transcribed using the Zoom videoconferencing platform. Transcripts will then be manually de-identified. Interviews will follow a schedule that covers the following topics:

- Perceived value of the EMCAT as a data-capture platform
- Acceptability of EMCAT
- Perceived burden of EMCAT
- Facilitators and barriers to using EMCAT
- Areas for improvement within the EMCAT platform
- The potential for EMCAT's use in remote monitoring and clinical decision support

Participants will be given opportunity to discuss any other aspects of the EMCAT platform they consider important.

### **Intervention Type**

Device

### **Phase**

Not Applicable

### **Drug/device/biological/vaccine name(s)**

EMCAT app

### **Primary outcome(s)**

1. Response rates to EMCAT notifications across different scheduling regimes, measured using the app over 12 weeks
2. Attrition rate, recorded as the number of participants who consent to participate that remain in the study until the end of follow up at 12 weeks, across different scheduling regimes

### **Key secondary outcome(s)**

1. User engagement, as measured by the User Engagement Scale at 12 weeks
2. Agreement of EMCAT scores and full-length PEM scores over 12 weeks
3. Number of items administered and standard error of measurement in each assessment, over 12 weeks
4. Explored using semi-structured interviews:
  - 4.1 The perceived value of the EMCAT as a data-capture platform
  - 4.2 The acceptability of EMCAT
  - 4.3 The perceived burden of EMCAT
  - 4.4 Facilitators and barriers to using EMCAT
  - 4.5 Areas for improvement within the EMCAT platform
  - 4.6 The potential for EMCAT's use in remote monitoring and clinical decision support

### **Completion date**

07/12/2022

# Eligibility

## Key inclusion criteria

1. Participant aged over 18 years and undergoing treatment for recent hand trauma or thumb-base osteoarthritis (OA)
2. Able to provide informed consent
3. Able to download and use the EMCAT app onto a personal smartphone

## Participant type(s)

Patient

## Healthy volunteers allowed

No

## Age group

Adult

## Lower age limit

18 years

## Sex

All

## Total final enrolment

40

## Key exclusion criteria

The participant may not enter the study if they have any communicative or cognitive barrier that would prevent them from engaging in the interview process

## Date of first enrolment

01/01/2022

## Date of final enrolment

01/06/2023

# Locations

## Countries of recruitment

United Kingdom

## Study participating centre

### Amersham Hospital

South Buckinghamshire NHS Trust

Whielden Street

Amersham

United Kingdom

HP7 0JD

**Study participating centre**  
**Cardiff & Vale University Lhb**  
Woodland House  
Maes-y-coed Road  
Cardiff  
United Kingdom  
CF14 4HH

## Sponsor information

**Organisation**  
University of Oxford

**ROR**  
<https://ror.org/052gg0110>

## Funder(s)

**Funder type**  
Research council

**Funder Name**  
The British Society for Surgery of The Hand

**Funder Name**  
AOUK

## Results and Publications

**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

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
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<a href="#">Results article</a>		14/09/2023	15/09/2023	Yes	No
<a href="#">HRA research summary</a>			28/06/2023	No	No
<a href="#">Protocol file</a>	version 1.1	05/12/2021	11/01/2022	No	No
<a href="#">Protocol file</a>	version 2.0	14/05/2022	19/05/2022	No	No