Markers of cortical reorganisation in Complex Regional Pain Syndrome (CRPS): progress report.

Dr Christopher Brown, Department of Psychological Sciences, University of Liverpool.

Dr Michael Lee, Division of Anaesthesia, University of Cambridge.

Dr Nicholas Shenker, Department of Rheumatology, Addenbrooke's Hospital, Cambridge.

Progress and timeline to completion

The two major parts to the study are an EEG session and the MRI/fMRI session. PRF funding is largely contributing to the MRI scan costs (session 2).

We have made good progress with participant recruitment: To date, all healthy controls and all except 3 CRPS patients have been recruited and completed the EEG part of the study. All the remaining 3 patients have been identified and are awaiting appointments.

As we communicated in last year's report, the main delays to completion have been in relation to the second session involving MRI scanning (due to upgrades to the Wolfson Brain Imaging Centre). For this reason, last year, we were granted by the PRF a no-cost extension until 1st June 2018.

We now estimate that by June 2018, MRI data collection will be 88% complete. There have been difficulties as fewer participants than anticipated have been able to undertake MRI scanning safely upon screening. This has meant needing to identify more patients that we originally planned. To mitigate this we have been granted use of the national CRPS registry and are now recruiting from a wider geographical area. We therefore seek a no-cost extension for another 8 months from June 2018 to identify, screen and consent sufficient numbers (completion by Feb 2019).

Preliminary results and dissemination

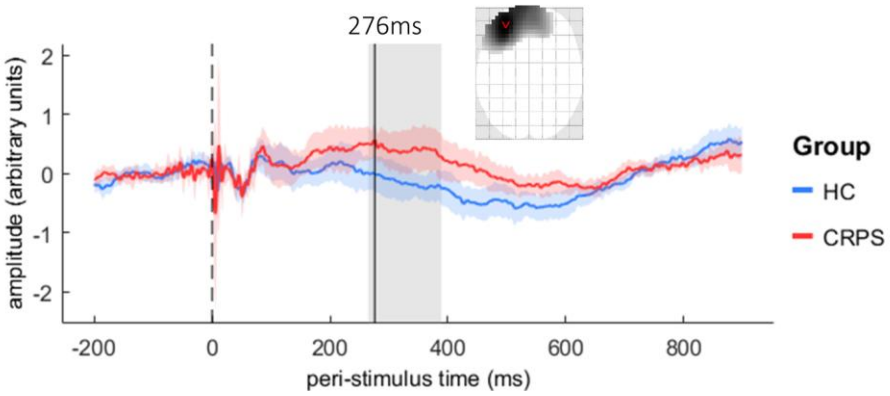
Preliminary EEG results (from interim analyses involving n=14 CRPS patients and n=22 healthy controls) were presented as part of an oral presentation session at the EFIC (European Pain Federation) conference in Copenhagen in September 2017.

We have been able to draw from preliminary conclusions from this interim analysis. So far, behavioural results from CRPS patients, from performing a digit discrimination task, points to delayed decision-making (compared to controls). On the other hand, decrements in discrimination ability (observed in previous studies) are less consistent across these patients – overall patients were not significantly less accurate at identifying their digits to touch. This agreed with EEG results showing no group difference in early spatially-sensitive signals from somatosensory cortex. Rather, patients were significantly slower to respond during the digit discrimination task, and this delay in response was correlated with increases in EEG responses occurring at a late-latency from frontal brain regions (see figure below), suggesting more of a "cognitive" deficit. These analyses motivate the need to investigate how plasticity in higher-order brain regions might interfere with perceptual task performance in CRPS patients. This is now one additional aim of the fMRI study that is ongoing.

Interim results

- Patients with CRPS have larger late-latency EEG responses (grey area on figure below) in response to tactile (digit touch) sensations, compared to a healthy control (HC) group
- Augmented EEG responses are related to longer response time on a digit identification task (chart on right)

EEG responses from the frontal part of the brain in each group after tactile stimulation of digits of the hand



Correlation with time-to-complete on digit identification task