

RCoA Research, Education & Travel Grants 2013

Award: The Stanley Rowbotham Fund

Applicant: Dr Marta Seretny

Project Title: Gaining insight into the neural correlates underpinning emergence from propofol anaesthetic: analysis of data from a functional magnetic resonance (fMRI) and electroencephalography EEG study

Project Description

Appropriateness:

The principal applicant is an anaesthetic trainee (ST4) undertaking a translational PhD in Edinburgh, focused on investigating chemotherapy induced peripheral neuropathy using fMRI. Her aim is to acquire skills in neuroimaging and data analysis in order to gain further understanding of anaesthetic effect on consciousness and improve patient care. She is the first fellow in Edinburgh to utilise neuroimaging research in anaesthesia and pain. This project proposal is aimed at introducing her to more complex neuroimaging data analysis techniques. Oxford's Centre for Functional Magnetic Resonance Imaging (FMRIB) is an international centre of excellence, with an extensive track record in anaesthesia and pain research. Time in Oxford will allow the participant to develop skills useful to furthering research in anaesthesia.

Background:

Dr Warnaby and Prof Tracey from the Anaesthesia and Pain Analgesia Imaging Neuroscience group (FMRIB, Oxford) lead a neuroimaging research programme aimed at addressing fundamental issues underpinning anaesthetic drug action. As part of this program they have acquired data during induction, maintenance and emergence from propofol anaesthesia. Findings regarding the induction and maintenance stages of the experiment have been accepted for publication. Data related to emergence from anaesthesia, known to be important in deciphering functional connectivity underpinning the conscious state, is available for analysis.

Methodology:

Aims:

To determine whether neural changes (EEG and fMRI) underpinning a return to consciousness following maintenance with propofol anaesthesia are analogous to changes seen during induction of anaesthesia.

Objectives:

We will utilise existing study data to correlate changes in slow wave activity measured using EEG with stimulus induced FMRI activity in order to decipher connectivity between the thalamus and frontal cortex with emergent responses (motor>auditory>word task).

Design:

The data is from a set of neuroimaging experiments utilising EEG and fMRI in 16 healthy volunteers receiving propofol anaesthesia (45 minute induction to 4µg/ml steady state infusion). Two separate experimental time points (days apart) were undertaken. EEG data was acquired in Experiment 1 and simultaneous EEG and fMRI were acquired in Experiment 2. During the induction and emergence phases of both experiments, subjects received laser and auditory stimuli, and a word task requiring a motor response. Individual propofol doses for loss and return of behavioural responsiveness were noted.

Analysis:

Statistical analysis of fMRI data will be carried out using FMRIB's Software Library (FSL). It will involve both resting state connectivity and functional BOLD signal analysis. EEG data will be processed using Brainvision.

Dissemination of findings:

Findings will be published in a peer-reviewed journal and presented at conferences. A summary of findings will be forwarded to the NIAA for dissemination in the anaesthetic community.