

Title

Assessing the effects of acute mild exercise on working memory: an EEG-fNIRS approach

Institution : University of Consortium (HWU, UDG, UB), Associated Partner

Universiti Teknologi PETRONAS, Ipoh, Malaysia

Training place

Optical Topography Lab, Centre for Intelligent Signal and Imaging Research

Supervisor name

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Brief Description of the project

Mental stress is one of the major contributing factors leading to various diseases such as heart attack, depression and stroke. Studies have shown that our working memory is susceptible to mental stress. The working memory is responsible for short-term memory and mentally manipulation of information. Long-term extensive exercise is known to improve our working memory. However, the effects of acute mild exercise, which is easier for us to practice in our daily life, are not known. In this project, we will investigate if a week of 20-min cycling/day could help reduce our stress level (hence improve stress coping). We will assess the mental stress level of healthy subjects (university students) before and after a week of exercise, using a method developed by our group recently. The method is based on joint Independent Component Analysis (jICA) using a combination of two neuroimaging techniques, i.e. electroencephalography (EEG) and functional near-infrared spectroscopy (fNIRS). The fNIRS is a relatively new technique and its signals correlate with fMRI BOLD signals as both are based on hemodynamic response to brain activity.

Your main role in this project is to develop the analysis of the EEG and fNIRS data. You will have the opportunity to learn in-house about the two neuroimaging modalities, EEG and fNIRS from data acquisition to data analysis. You will also be taught about how to obtain ethics approval to carry out such non-clinical trial, and statistical data analysis techniques. The objective of this project is twofold:

1. To develop a program to process EEG and fNIRS data (including the removal of systemic signals such as heart rate, respiration & Mayer waves from both cerebral and extracerebral regions, motion artifacts, and noise).
2. To develop a statistical data analysis to extract key parameters to study the effects of acute mild exercise on working memory.

Software/Hardware needs and skills

1. MATLAB software
2. Programming skills