UNIVERSITI TEKNOLOGI MARA

EEG-BASED TOPOGRAPHY OF READING-WRITING PATHWAY FOR DYSLEXIC WITH WRITING DISORDER AS AN ALTERNATIVE TO fMRI IMAGES

NOOR BARIAH BINTI MOHAMAD

MSc

6th Okt 2016

ABSTRACT

Dyslexia is a medical condition for people suffering from a learning disability, particularly in reading and writing. This is owing to impairment of the language processing area located in the left hemisphere of the human brain. A statistical survey reveals that 265, 210 Malaysian students are diagnosed with dyslexia in 2012. EEG method has been proven to be helpful in detecting dyslexia. However, in working on EEG, the pool of data is gargantuan, thus, wastage in resources and time if optimal electrode placement is not identified. Typically, EEG signals are processed and presented in time or frequency domain, without visual information. Here, this study intends; 1) to determine an optimal set of EEG electrode placement along relaxation and reading-writing neural pathway for normal and dyslexic, 2) to illustrate an EEG-based time and spatial interpretation of activated brain areas, 3) to study the correspondence between the 2D EEG topography and those from fMRI imaging, being the first attempt ever reported. Target population are normal adults (aged 18 to 25), normal HighIQ children, normal AverageIQ children, dyslexic Capable children and dyslexic Poor children (aged 6 to 12). The EEG signals are recorded with electrodes at activation areas along the documented signal pathway of the brain during state of relaxation and reading-writing tasks. FFT is applied to transform the EEG in time domain into frequency domain and visualization of 2D-EEG topography is generated through EEGLab and OpenVibe. Results show that the frequency range of EEG recorded from these electrode during relaxation is 8-13 Hz for all subjects, while that during writing are 13-29 Hz for normal adults, normal HighIQ and dyslexic Capable children, within the sub-bands known for the different neural activities accordingly. These findings conclude that electrodes C3/C4, P3/P4, T7/T8 and FC5/FC6 are suitable as optimal EEG electrode placement for comparison between normal and dyslexic children during reading-writing. Additionally, findings on laterization found that normal HighIQ children clearly highlighted on the left hemisphere, while neural activities of dyslexic Capable children are higher on the right hemisphere and dyslexic Poor children engaged in both left and right hemisphere of the brain. Despite difficulty in finding brain images of the same task and protocol, it is found that 2D EEG topography matched with fMRI brain images from previous research.