EEG-Based Classification of Psychiatric Disorders: Bipolar Mood Disorder vs. Schizophrenia

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Abstract : An accurate diagnosis of psychiatric diseases is a challenging issue, in particular when distinct symptoms for different diseases are overlapped, such as delusions appeared in bipolar mood disorder (BMD) and schizophrenia (SCH). In the present study, we propose a useful way to discriminate BMD and SCH using electroencephalography (EEG). A total of thirty BMD and SCH patients (15 vs. 15) took part in our experiment. EEG signals were measured with nineteen electrodes attached on the scalp using the international 10-20 system, while they were exposed to a visual stimulus flickering at 16 Hz for 95 s. The flickering visual stimulus induces a certain brain signal, known as steady-state visual evoked potential (SSVEP), which is differently observed in patients with BMD and SCH, respectively, in terms of SSVEP amplitude because they process the same visual information in own unique way. For classifying BDM and SCH patients, machine learning technique was employed in which leave-one-out-cross validation was performed. The SSVEPs induced at the fundamental (16 Hz) and second harmonic (32 Hz) stimulation frequencies were extracted using fast Fourier transformation (FFT), and they were used as features. The most discriminative feature was selected using the Fisher score, and support vector machine (SVM) was used as a classifier. From the analysis, we could obtain a classification accuracy of 83.33 %, showing the feasibility of discriminating patients with BMD and SCH using EEG. We expect that our approach can be utilized for psychiatrists to more accurately diagnose the psychiatric disorders, BMD and SCH.