World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:17, No:04, 2023

Resting-State Functional Connectivity Analysis Using an Independent Component Approach

Authors : Eric Jacob Bacon, Chaoyang Jin, Dianning He, Shuaishuai Hu, Lanbo Wang, Han Li, Shouliang Qi

Abstract : Objective: Refractory epilepsy is a complicated type of epilepsy that can be difficult to diagnose. Recent technological advancements have made resting-state functional magnetic resonance (rsfMRI) a vital technique for studying brain activity. However, there is still much to learn about rsfMRI. Investigating rsfMRI connectivity may aid in the detection of abnormal activities. In this paper, we propose studying the functional connectivity of rsfMRI candidates to diagnose epilepsy. Methods: 45 rsfMRI candidates, comprising 26 with refractory epilepsy and 19 healthy controls, were enrolled in this study. A data-driven approach known as independent component analysis (ICA) was used to achieve our goal. First, rsfMRI data from both patients and healthy controls were analyzed using group ICA. The components that were obtained were then spatially sorted to find and select meaningful ones. A two-sample t-test was also used to identify abnormal networks in patients and healthy controls. Finally, based on the fractional amplitude of low-frequency fluctuations (fALFF), a chi-square statistic test was used to distinguish the network properties of the patient and healthy control groups. Results: The two-sample t-test analysis yielded abnormal in the default mode network, including the left superior temporal lobe and the left supramarginal. The right precuneus was found to be abnormal in the dorsal attention network. In addition, the frontal cortex showed an abnormal cluster in the medial temporal gyrus. In contrast, the temporal cortex showed an abnormal cluster in the right middle temporal gyrus and the right fronto-operculum gyrus. Finally, the chi-square statistic test was significant, producing a p-value of 0.001 for the analysis. Conclusion: This study offers evidence that investigating rsfMRI connectivity provides an excellent diagnosis option for refractory epilepsy.

Keywords : ICA, RSN, refractory epilepsy, rsfMRI
Conference Title : ICABB 2023 : International Conference on Advanced Bioinformatics and Biology
Conference Location : Beijing, China
Conference Dates : April 03-04, 2023

Open Science Index, Bioengineering and Life Sciences Vol:17, No:04, 2023 publications.waset.org/abstracts/163903.pdf