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Gender Effects in EEG-Based Functional Brain Networks

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Abstract : Functional connectivity in the human brain can be represented as a network using electroencephalography (EEG) signals. Network representation of EEG time series can be an efficient vehicle to understand the underlying mechanisms of brain function. Brain functional networks – whose nodes are brain regions and edges correspond to functional links between them – are characterized by neurobiologically meaningful graph theory metrics. This study investigates the degree to which graph theory metrics are sex dependent. To this end, EEGs from 24 healthy female subjects and 21 healthy male subjects were recorded in eyes-closed resting state conditions. The connectivity matrices were extracted using correlation analysis and were further binarized to obtain binary functional networks. Global and local efficiency measures – as graph theory metrics– were computed for the extracted networks. We found that male brains have a significantly greater global efficiency (i.e., global communicability of the network) across all frequency bands for a wide range of cost values in both hemispheres. Furthermore, for a range of cost values, female brains showed significantly greater right-hemispheric local efficiency (i.e., local connectivity) than male brains.

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