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Establishing an acquisition and processing protocol for resting state networks with a 1.5 T scanner

A case series in a middle-income country

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Abstract

Objective: The aim of this study was to characterize the capability of detection of the resting state networks (RSNs) with functional magnetic resonance imaging (fMRI) in healthy subjects using a 1.5T scanner in a middle-income country.

Materials and methods: Ten subjects underwent a complete blood-oxygen-level dependent imaging (BOLD) acquisition on a 1.5T scanner. For the imaging analysis, we used the spatial independent component analysis (sICA). We designed a computer tool for 1.5 T (or above) scanners for imaging processing. We used it to separate and delineate the different components of the RSNs of the BOLD signal. The sICA was also used to differentiate the RSNs from noise artifact generated by breathing and cardiac cycles.

Results: For each subject, 20 independent components (IC) were computed from the sICA (a total of 200 ICs). From these ICs, a spatial pattern consistent with RSNs was identified in 161 (80.5%). From the 161, 131 (65.5%) were fit for study. The networks that were found in all subjects were: the default mode network, the right executive control network, the medial visual network, and the cerebellar network. In 90% of the subjects, the left executive control network and the sensory/motor network were observed. The occipital visual network was present in 80% of the subjects. In 39 (19.5%) of the images, no any neural network was identified.

Conclusions: Reproduction and differentiation of the most representative RSNs was achieved using a 1.5T scanner acquisitions and sICA processing of BOLD imaging in healthy subjects.

Abbreviations: AAN = Arousal Network Atlas, AAn = ascending arousal network, ADC = apparent diffusion coefficient, AIC = analysis of independent component, AN = auditory network, BOLD = blood-oxygen-level dependent, CBLN = the cerebellar network, DIPY = diffusion imaging in python, DMN = default mode network, DOC = disorder of consciousness, DTI = diffusion tensor imaging, DTT = diffusion tensor tractography, DWI = diffusion weighted imaging, FA = fractional anisotropy, FC = functional connectivity, FSL = FMRIB Software Library, LECN = left executive control network, LMICs = low-to-middle income countries, LVN = lateral visual network, MoCA = Montreal Cognitive Assessment, MVN = medial visual network, ODF = orientation distribution function, OVN = occipital visual network, RECN = right executive control network, RF = reticular formation, ROI = region of interest,

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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