Multi-modal fusion and Graph theory based comparison between Cocaine dependents and healthy controls

ABSTRACT

Recently, collecting multiple types of brain data from the same individual using various non-invasive imaging techniques (MRI, DTI, EEG, MEG, etc.) has become common practice. Each imaging technique provides a different view of brain function or structure. Fusing modalities provides a means to reveal complicated hidden relationships between modalities and weak latent effects in high-dimensional data by taking advantage of the presence of cross-information in cross-individual variance.

OBJECTIVE

- Identification and extraction of the functional connectivity measures that are computed based on graph theory analysis of the networks of the brain.
- Study the effect of Altases (Harvard Oxford Atlas, Desikan- Killiany Atlas etc.) on the extracted functional connnectivity measures.
- Using structural connectivity measures and functional connectivity measures as the two modalities for the multi-modal fusion based techniques like JICA, JICA+MCCA.

METHODS

Resting-state fMRI (rsfMRI) data was obtained from 62 active CD (mean age 31 ± 7.03 SD) and 45 NC (mean age 31 ± 7.76 SD) matched for age, sex, education and socioeconomic status, of Mexican origin. Subjects were assessed with a cand a thorough psychiatric interview assessing substance use and psychopathology. Subjects were scanned in a 3T Philips Ingenia with a 32-channel coil. Ten minute rsfMRI data was collected with 3 mm3 voxels and a TR = 2s. Preprocessing was done using the CPAC pipeline which included: slice-timing correction, volume realignment, registration and normalization. Nuisance regressors were: motion parameters, CompCor (5), CSF and WM signals, global signal, Friston's 24 motion parameters, linear and quadratic detrending. We performed hard scrubbing at FD 0.5 mm, applied a temporal fillter of 0.01 – 0.1 Hz and smoothed at 6 mm FWHM. Features are computed for each individual. MCCA(Multimodality Canonical correlation analysis) is used to do data reduction of these features. Spatially independent components will be extracted from the reduced data. Each component shares a common loading or mixing parameter between the modalities, this is called joint ICA. This is process is called as MCCA + joint ICA blind method.

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