Frequency amplitude differences in substance users resting state functional network connectivity

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Background: Resting state studies have indicated that abnormal functional connectivity patterns exist in the brains of substance users. In this work we aim to investigate changes of resting state frequency amplitude occurring in the brain of smokers and drinkers. The main hypothesis is that low frequencies will exhibit lower resting state activation in substance users when compared to controls.

Methods: Data were collected from 71 females and 117 males between the ages of 18 and 54 (33.3 ± 9.3) years. Four groups were defined: control (CTR), drinker (DRN), smoker (SMK), and smoking and drinking (SAD). Resting state functional MRI data were collected on a 3T Siemens TIM Trio (Erlangen, Germany) scanner. Participants kept their eyes open during the 5 minute resting scan. The data were then analyzed with Infomax based group. A total of 39 components were selected. Fractional amplitude of low frequency fluctuations (fALFF) were calculated for all components and subjects using the frequency band [0.01 0.20] Hz. Separate fALFF values calculated for each discrete frequency were analyzed using a MANOVA test. The frequency bands of components passing the multivariate test were subjected to additional unpaired t-tests.

Results: One MANOVA test was significant after Bonferroni correction at the 0.05 level. Figure 1 shows the spatial map of the resulting component with peak activation in the postcentral gyrus. Figure 1 also shows the frequency spectrum and post-hoc t-tests. Low frequencies show decreased fALFF and high frequencies an increased fALFF.

Conclusions: The postcentral gyrus show abnormal activations at different frequencies. These abnormalities were not observed by single valued aggregated fALFF, but only when analyzing separated frequencies. Observed fALFF differences are consistent with dysfunctional connectivity results involving sensorimotor areas.