Functional connectivity between fear network regions correlates with subliminal scores of anxiety and depression in healthy participants

A. Sushiskaya-Tetereva¹, V. Balaev¹, O. Martynova¹ ²

¹Institute of Higher Nervous Activity and Neurophysiology RAS, Moscow, Russia, ²National Research University “Higher School of Economic”, Moscow, Russia.

Background: Several resting-state investigations demonstrate altered resting state functional connectivity (rsFC) in patients with posttraumatic stress disorder (PTSD) in the brain areas presumably included in the “fear network”: amygdala, insula, anterior cingulate cortex (ACC) and ventromedial prefrontal cortex (vmPFC). We aimed to explore a possible correlation between rsFC of these targeted regions and anxiety and depression subliminal scores obtained in healthy subjects.

Methods: Seventeen (age 24.2±4; 7 males) young healthy right-handed adult voluntaries participated in the study. Each participant filled questionnaires of The State-Trait Anxiety Inventory and Beck Depression Inventory before fMRI acquisition (T2*-weighted EPI (300 volumes, TR = 2 s, TE= 20 ms, 42 slices, slice thickness – 2.6 mm, FoV-200 mm, matrix size- 98x98) at rest. Data was preprocessed using SPM8. Forty five components were extracted via ICA (GIFT). 7 of them represented common resting state networks, located in following areas: primary visual, secondary visual, language (left auditory cortex, Broca and Wernicke's areas), temporopolar (TMPP), orbitofrontal, insular cortex, anterior prefrontal cortex (aPFC), left and right striatum (extracted separately), medial prefrontal cortex (mPFC). For each of them total activation volume was calculated (Z>2). Six bilateral ROIs, associated with “fear network” were selected for FC analysis: ACC, posterior cingulate cortex (PCC), vmPFC, amygdala, hippocampus, insula. FC values were subjected to correlation analysis with psychological scores.

Results: State anxiety scores positively correlated with volumes of resting state activation in aPFC (r=-0.5, p=0.04) and negatively with the activation volume in insular network (r= -0.5, p=0.02). Trait anxiety scores correlated positively with aPFC network volume (r=0.8, p= 0.001) and negatively with the activation volume in the TMPP area (r= -0.5, p= 0.03). Depression scores showed positive correlation with aPFC network volume (r=0.7, p= 0.004) and negative correlations with the volume of the language network (r= -0.7, p= 0.001), and mPFC located network (r= -0.8, p= 0.0001). FC values showed a significant negative correlation with state anxiety scores for ACC and PCC, between left PCC and left vmPFC (r=-0.6, p=0.02), between right insula and right vmPFC (r=-0.5, p=0.03). Trait anxiety scores correlated negatively only with FC between left PCC and left vmPFC (r=-0.5, p=0.05).

Conclusions: Our data demonstrate that even in healthy participants rsFC values in the key regions associated with fear processing significantly correlate with subliminal scores for anxiety and depression suggesting. In PTSD patients particular attention should be made to the rsFC features found to correlate with depression and anxiety scores. 

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