

## Temporal modulation in connectivity within the salience network in autism spectrum disorder

J. Nikkinen<sup>1</sup>, J. Rahko<sup>2</sup>, T. Starck<sup>1</sup>, J. Remes<sup>1</sup>, A. A. Elseoud<sup>1</sup>, I. Moilanen<sup>2</sup>, O. Tervonen<sup>1</sup>, and V. Kiviniemi<sup>1</sup>

<sup>1</sup>Department of Diagnostic Radiology, Oulu University Hospital, Oulu, Finland, <sup>2</sup>Department of Child Psychiatry, Oulu University Hospital, Oulu, Finland

**Introduction:** The neurobiological evidence for autism spectrum disorder (ASD) should be looked from a brain system controlling other brain functions. One of the most important brain network (Sridharan et al.), salience network (SN), has its main nodes in anterior insula (AI) and anterior cingulate cortex (ACC). In the recent review, the importance of SN in autism research was pointed out by Uddin et al. They proposed that the dysfunctional AI connectivity plays a major role in autism. However, connectivity of AI is still poorly understood and most theoretical approaches have ignored this brain structure in explaining the deficits in ASD. In this study we hypothesized that the temporal modulation in connectivity between the main SN nodes, AI and ACC, is altered in ASD.

**Methods:** A continuous fixation task of 7.5 minutes was given for participants (28 ASD subjects, mean age 14.58±1.62 yrs, 8 ♀, 20 ♂ and 27 control adolescents, mean age 14.49±1.51 yrs, 9 ♀, 18 ♂) as a resting state study. Imaging was performed using a 1.5 T GE Signa HDx (TR=1800ms/250 time points, FOV 25.6 cm x 25.6 cm, 64 x 64 matrix, flip angle 90°). High model order (70 components) group independent component analysis (ICA), implemented in FSL Melodic software was utilized to functionally segment the brain cortex (Kiviniemi et al.) and to obtain the component related mixing matrix time courses. Measure of temporal modulation between independent components was defined as a Pearson's correlation coefficient between the component time courses as a function of time. Correlation value for each time point was calculated using 60 TR long time window including the previous 30 and the next 30 time points. Using DFT, the subject level temporal modulation in connectivity was transformed into frequency domain and between group differences were analyzed frequency-wise using the two-sample t-test for DFT amplitudes.

**Results:** One IC was found to be focused at AI. ACC structure was shown to be detectable in two ICs, ventral ACC (vACC) and dorsal ACC (dACC), see Fig. 1. Between the AI and vACC components, we found differences at several frequencies between the groups. These differences are pointed out using arrows in Fig. 2a together with the uncorrected p-values. No group differences were obtained between the AI and dACC or between the vACC and dACC. Fig. 2b and 2c. show example plots of temporal modulation in connectivity between AI and vACC for three subjects from both groups. As is clearly seen, the modulation in connectivity is very high for both groups.

**Conclusions:** In conclusion we show that ASD subjects have altered temporal modulation in connectivity between the main SN structures, AI and ACC. These findings support the theory of disturbed SN function in ASD. In future, connectivity analysis of SN structures with other components, especially with default mode and executive control ones, may be useful to gain wider perspective of SN dysfunction in ASD.

### References:

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