**Functional and chemical imaging of language processing in Autism Spectrum Disorder**

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**Introduction:** Theoretical models and experimental data1-8 have led to the hypothesis that atypical regulation of excitatory and inhibitory control throughout the brain is a root cause in autism spectrum disorder (ASD). This imbalance between excitatory and inhibitory control is thought to give rise to dysfunctional long-range synchronization between neural systems1-3. Long-range synchronization of activity in the cortex is largely mediated through glutamatergic excitatory and GABAergic inhibitory neurotransmissions, and is thus altered by an excitatory-inhibitory imbalance, i.e., E/I imbalance hypothesis. Here we present preliminary results from magnetoencephalography (MEG) source imaging of rhythmic brain activity during lexical decision making in combination with neurochemical measurements using magnetic resonance spectroscopy (MRS) within a cohort of high-functioning adults with ASD.

**Methods:** Seventeen ASD subjects (22.2±1.2; M±SD years of age; 3 females) were individually sex- and age-matched to 17 typically developing (TD) peers (21.8±2.0 years of age). The ASD participants had been diagnosed at an early age. Event-related neuromagnetic data was acquired using MEG in combination with a lexical decision task where subjects were required to monitor a stream of randomly presented monosyllabic English words and acoustic controls, and press a button to infrequent occurrences of target words (c. 10% of trials). Single voxel MRS was used to measure glutamate (PRESS pulse sequence with TE=30) and GABA (MEGA-PRESS pulse sequence with TE=80 and macromolecule suppression) bilaterally in voxels that encompassed the perisylvian and insular cortex. Chemical measurements were referenced to water and corrected for partial volume effects.

**Results:** Auditory word stimuli resulted in spatiotemporal activation patterning in bilateral frontotemporal cortex spanning posterior perisylvian temporal and inferior frontal structures. Preliminary MRS results indicate a hemispheric asymmetry in GABA concentrations in the ASD group, with higher GABA concentration in the left hemisphere (1.1±0.2 mmol/kg; M±SD) than in the right (0.9±0.2 mmol/kg) *p=.01*.

**Conclusions:** Preliminary results from MEG source imaging show involvement of bilateral frontotemporal cortex during lexical decision making that is in line with models of language networks. Furthermore, early results of MRS data analysis indicate asymmetric inhibitory GABAergic concentrations between hemispheres in the ASD group but not in the control group. Further analysis will evaluate relationship between putative E/I imbalance to functional brain activity measures from MEG.

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