MEG study of cortical coherence in autism spectrum disorders

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Recently, a significant body of evidence has accumulated in support of the cortical long range hypo-connectivity hypothesis of autism; the hypothesis states that individuals with autism have weaker than normal long range cortical functional connectivity, which may contribute to the cognitive abnormalities underlying autism. The majority of the studies investigating this thesis are fMRI based. While those studies have enriched the field significantly, they are limited by the low temporal resolution of fMRI, which prohibits fine temporal resolution analysis of functional connectivity, e.g. the distribution across the spectrum of frequency bands. Our goal was to further our understanding of the nature of hypo-connectivity in autism, and specifically its correlation with (1) specific frequency bands, (2) task demands, and (3) distance between the cortical regions. To that end, we studied 11 high functioning adults with autism spectrum disorders and 11 age, gender, verbal IQ and socio-economic status matched healthy controls using whole head Magnetoencephalography (MEG). We looked at three conditions - fixation with i) no immediate associated task ('fixation'), and fixation in preparation for ii) a saccade or iii) an antisaccade task. For each subject and condition, we analyzed 70 seconds of concatenated data for coherence in the delta, theta and alpha frequency bands. Significant coherence reduction in the autism spectrum group was observed for all three conditions, in the alpha band. The observeddifferences tended to be more pronounced for longer distances, ensuring this is not a field spread effect. The regions driving the differences were mostly posterior to frontal. We saw no task dependence of the results for this particular task. Also, none of the differences between groups in other frequency bands reached significance. These observations support the hypothesis of weaker long-range cortical functional connectivity in autism spectrum disorders. Our thus far preliminary findings indicate that weaker functional connectivity seems to be band and region dependent.