How reliable are gray matter disruptions in dyslexia? The issue of subtypes.

The neural basis of developmental dyslexia remains only partly understood. A dozen studies have used voxel-based morphometry (VBM) to investigate grey matter volume (GMV) differences between dyslexic and control children however recent meta-analyses suggest that few regions are consistent across studies. We used data collected across three countries (France, Poland and Germany) with the aim of both increasing sample size (236 SRD and controls) to obtain a clearer picture of group differences, and of further assessing the consistency of the findings across languages. VBM analysis reveals a significant group difference in a single cluster in the left thalamus. Most strikingly, we failed to replicate all the group differences in GMV reported in previous studies, despite the superior statistical power. Explanations for the discrepancy between the present and previous studies may include: 1) the limited suitability of VBM to reveal the subtle brain disruptions underlying dyslexia; 2) insufficient correction for multiple statistical tests and flexibility in data analysis or 3) the heterogeneity of the disorder.

Second part of the talk will be devoted to studies searching for potential subtypes of developmental dyslexia. Using data from the Polish sample, we performed cluster analysis on the dyslexic children and investigated the GMV differences between the obtained clusters. Children were into three subtypes based on the presence of cognitive deficits: phonological, rapid naming, magnocellular/dorsal, and auditory attention shifting. VBM revealed GMV clusters specific for each studied group including areas of left inferior frontal gyrus, cerebellum, right putamen, and bilateral parietal cortex. In addition, using discriminant analysis on these clusters 79 % of cross-validated cases were correctly re-classified into four groups (controls vs. three subtypes). The results indicated that dyslexia might result from distinct cognitive impairments characterized by distinguishable anatomical markers.