Cortical thickness correlates with symptoms in adolescents newly diagnosed with Obsessive-Compulsive Disorder

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Target audience: Neuroscientists

Purpose/Introduction: Obsessive compulsive disorder (OCD) is a disabling anxiety disorder, commonly with an onset during late childhood or early adulthood. The purpose of the study was to explore morphometric manifestations and correlates of newly diagnosed OCD patients before start of treatment. Specifically, the aims of the study were (1) to compare morphometric results between patients with OCD and healthy controls and (2) to evaluate the relationship between morphometric results and the symptom severity in the patient group as quantified with the Children's Yale- Brown Obsessive Compulsive Scale (CYBOCS).

Subjects and Methods: T1-weighted 3D MR brain images of 22 adolescents newly diagnosed with OCD (treatment naïve) and 22 age and gender matched controls were acquired using a TFE sequence on a 1.5 T Philips Achieva MR scanner and a 1.5 T Philips Intera MR scanner (Best, the Netherlands) with voxel size 1.25 mm (isotropic). The 3D images were processed with the image analysis software FreeSurfer[1] (version 5.1). The morphometric results which were further processed were the cortical thickness maps, smoothed with Gaussian kernel (FWHM = 10 mm), and the volume measurements of the subcortical structures. The data was analyzed using principal component analysis scaled subprofile modeling[2] (PCA/SSM), as outlined in figure 1, to produce patterns of areas with significant difference between groups or correlation to CYBOCS. The method utilized nonparametric permutation tests[3] to correct for multiple testing as well as bootstraping[4] to assess the robustness of the resulting pattern.

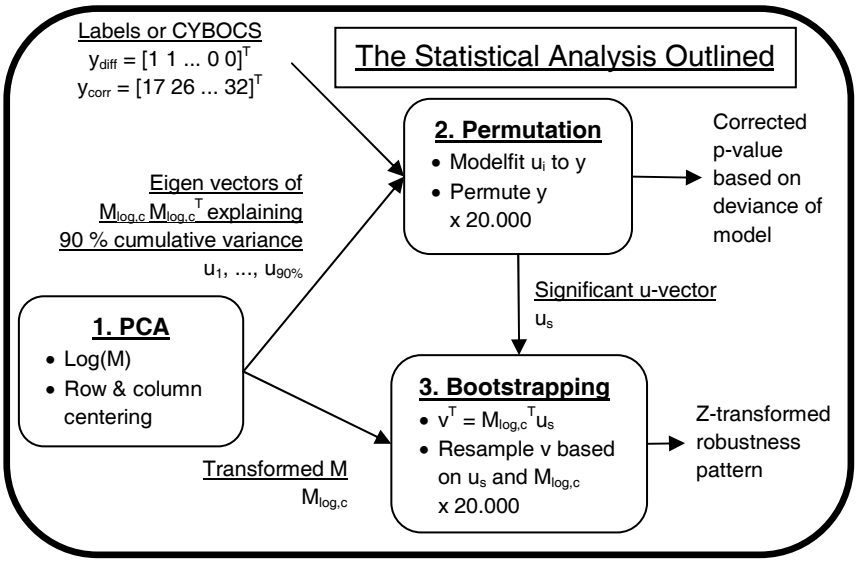

Figure 1. Outline of the statistical analysis:
1. PCA: M is a N-by-V-matrix, where N is the number of subjects and V is the number of vertices/volumes, comprising all data. Before the PCA, M was logarithmically transformed. The mean of each row and column was then subtracted to enable PCA.
2. Permutation: Labels in y_{diff} refers to patients/controls. Entries in y_{corr} are the CYBOCS scores of the patients. When testing for group differences logistic regression was used. When testing for correlation to CYBOCS linear regression was used.

Results: A significant correlation between cortical thickness and CYBOCS, p = 0.035, was found. Areas of large effect in the corresponding pattern included the fusiform gyrus as well as medial areas in the parietal lobe (fig. 2). No other significant results were found, neither group differences nor correlation to CYBOCS.

Discussion/Conclusion: Cortical thickness in various medial areas of the brain of treatment naïve OCD patients was found to correlate with symptom severity, indicating increased/decreased function of these areas.

References:

1. http://surfer.nmr.mgh.harvard.edu/
2. D. Eidelberg. Metabolic brain networks in neurodegenerative disorders: a functional imaging approach. Trends in neurosciences, 10:548-557, 2009.
3. T.E. Nichols and A.P. Holmes. Nonparametric Permutation Tests for Functional Neuroimaging: A Primer with Examples. Human Brain Mapping, 15:1-25, 2002.
4. Efron, B. and Tibshirani, R. An Introduction to the Bootstrap, CRC Press, 1994.

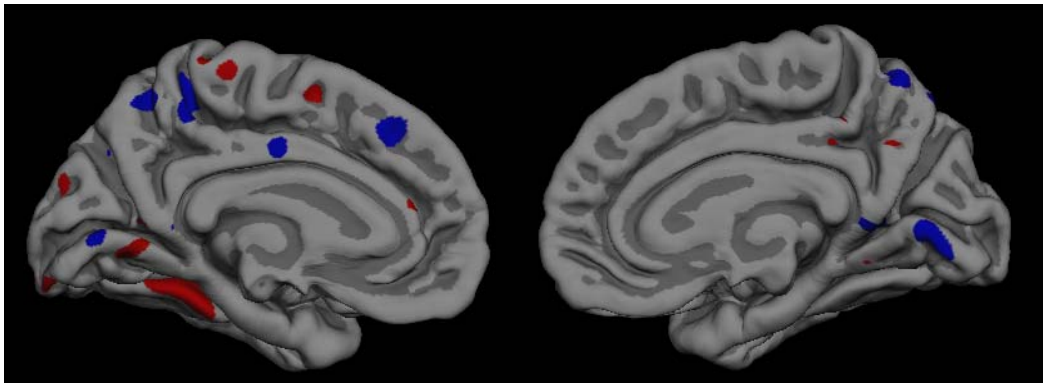

Figure 2. The Z-map of the significant pattern thresholded at |Z| = 1.96. Blue clusters indicate reducing thickness with increasing CYBOCS while red clusters indicate increasing thickness with increasing CYBOCS. A medial view is used as it shows all prominent clusters. Moreover, the lateral areas of each hemisphere (>45 mm from mid-sagittal plane) were not included into the statistical analysis due to incomplete image coverage of the brain.