degree of age related brain asymmetry plasticity relatively independent of illness status.

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Poster 99
GYRIFICATION IN TWINS DISCORDANT FOR SCHIZOPHRENIA

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Background: Measures of cortical folding have increasingly been used to assess morphological properties previously not measured in high-resolution MRI scans. Assumed to be under genetic influence and relatively stable over the (adult) life-span, the local gyrification index can be measured in 3D across the entire cortical surface. Here we present initial results from the STAR consortium and EUTwinsS network assessing differences in cortical gyrification in monozygotic (MZ) twins discordant for schizophrenia and healthy controls to assess the impact of disease manifestation on cortical folding. This design is chosen to match for genetic Background (quasi-identical in MZ twins) to study disease effects, especially for the prefrontal cortex, where alterations in gyrification have been described in singletons with schizophrenia.
Methods: We analysed samples from two network sites: 7 MZ twin pairs discordant for schizophrenia and 7 MZ healthy control twin pairs (Heidelberg sample) and 8 MZ twin pairs disocrdant for schizophrenia and 8 MZ healthy control pairs (London sample). Cortical surfaces were extracted using FreeSurfer software from high-resolution MRI scans (1.5 T) and local gyrification was then calculated using local curvature based measures developed in-house (Luders et al., NeuroImage 2006).
Results: Comparing the affected MZ twin to his/her co-twin, we found altered gyrification in frontal areas in both samples, albeit at somewhat different locations: in the right medial prefrontal area for the Heidelberg sample and more anterior in the right frontopolar cortex in the London sample.
Discussion: If replicated in our on-going extension of these samples, these findings would suggest that disturbed prefrontal gyrification in schizophrenia is not purely an effect of genetic mechanisms, as it differes between monozygotic twins. Rather, it might (at least in part) reflect the expression of the disease phenotype or even progressive changes.

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Poster 100
REDUCED BRAIN CORTICAL FOLDING IN SCHIZOPHRENIA

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Background: Morphological brain abnormalities have been extensively reported in MRI-based studies of patients with schizophrenia. The timing, nature, and progress of such abnormalities are not clear. The folding of the cerebral cortex is mainly determined during gestation and early childhood and thus represents a window for investigating the early development of the brain. The aim of this study was to investigate differences in cortical folding using automated magnetic resonance imaging (MRI) tools between patients with schizophrenia and healthy control subjects.
Methods: MRI scans were acquired from 208 patients with schizophrenia and 206 healthy subjects from two separate cohorts, one recruited at the Karolinska Hospital in Stockholm, Sweden (96 patients and 105 healthy subjects, mean age patients and controls 42 years, mean duration of illness among the patients 17 years) and the other recruited at the University of Oslo, Norway (112 patients and 101 healthy subjects, mean age patients 31 years, mean age controls 37 years, mean duration of illness among the patients 4 years). The scans were processed with an automated computer-based method for measuring the local gyrification index (*l*GI) at numerous points across the cortex. The method is freely available at http://surfer.nmr.harvard.edu/fswiki/lgi. The *l*GI is computed as the ratio between the area of the folded cortical surface within a defined radius from the vertex and the area of the outer cerebral surface within the same radius. A higher index indicates a higher degree of cortical folding. General linear models controlling for age and gender were used to analyse differences in *l*GI between patients and controls. A false discovery rate (FDR) of 5% was applied to correct for multiple tests.
Results: Lower *l*GI was found among the patients in areas comprising the lateral posterior temporal cortex in the right hemisphere, and the pericentral cortex in the left hemisphere ($p < 0.01$, uncorrected). When adjusting for FDR, the group differences in left pericentral cortex remained significant. The results were essentially similar in both cohorts. In the Swedish cohort, including patients in a more chronic phase of the illness, lower *l*GI was found both in the right lateral posterior temporal cortex and in the left pericentral cortex, while in the Norwegian cohort, including patients in an earlier phase of the illness, lower *l*GI was found predominantly in the left pericentral cortex ($p < 0.01$, uncorrected).
Discussion: The results indicate that degree of folding is reduced in distinct areas of the cerebral cortex among patients with schizophrenia. The similar pattern of findings across two separate cohorts with patients at different stages of the disease indicates that reduced degree of folding may be an inherent feature of schizophrenia. The results further suggest a neurodevelopmental origin for the disease.

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Poster 101
DECREASED FRACTIONAL ANISOTROPY IN INTER-HEMISPHERIC CONNECTION BETWEEN BILATERAL SUPERIOR TEMPORAL GYRUS GRAY MATTER IN CHRONIC SCHIZOPHRENIA

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Background: The superior temporal gyrus (STG) is one of the most frequently reported gray matter structures to be implicated in

schizophrenia [1,2]. Another line of research suggests loss of efficient inter-hemispheric communication as a possible source of schizophrenia pathology [3]. These findings led us to hypothesize differences in inter-hemispheric connections in white matter between left and right superior temporal gyrus (STG) gray matter. Such a study is technically challenging because single-tensor streamline tractography methods do not reliably resolve the fiber tracts of interest. In this study, we used a novel filtered two-tensor tractography method [4] to test the hypothesis in chronic schizophrenia.

Methods: Structural magnetic resonance images (MRI) and diffusion weighted images (DWI) were acquired from 18 patients with chronic schizophrenia (SZ) and 16 normal controls (NC). The two groups were matched in age, gender, handedness and parental socio-economic status. For all subjects, the gray matter of the bilateral STG was segmented from the structural MRI, which was registered to the DWI, using Freesurfer (http://surfer.nmr.mgh.harvard.edu, an automatic segmentation tool). They served as regions of interest (ROIs) to extract the inter-hemispheric fiber tracts connecting the STGs from whole-brain filtered two-tensor tractography. A clustering method [5] was then used to remove extraneous fiber tracts. The mean fractional anisotropy (FA), mode, trace, parallel and perpendicular diffusivity of the resulting fiber tracts were computed for each subject.

Results: ANOVA test revealed group effects for mean FA ($p = 0.037$) and perpendicular diffusivity ($p = 0.040$), but not for mean mode ($p = 0.162$), trace ($p = 0.076$) or parallel diffusivity ($p = 0.339$). Of note, the filtered two-tensor tractography method, unlike the single-tensor streamline tractography, was able to reliably reproduce the fiber tracts between the bilateral STG gray matter for all subjects. This demonstrates its capability for tracing through crossings and branchings, which is impossible with single-tensor model.

Discussion: Findings suggest decreased FA and perpendicular diffusivity in inter-hemispheric fiber tracts between bilateral STG gray matter for SZ compared to NC, indicative of poorer white matter health in the former. Further studies will be carried out to associate these findings with positive and negative syndrome scale (PANSS) for schizophrenia, and to provide new insights into the role played by this inter-hemispheric connection between bilateral STG gray matter in thought and information processing.

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Poster 102

EFFECTS OF CATECHOL-O-METHYLTRANSFERASE VAL158MET ON GREY MATTER VOLUME IN ADOLESCENTS BORN PRETERM

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Background: Preterm birth is associated with altered grey matter and white matter distribution in adolescence, but little is known about how genetic vulnerability affects brain structure in individuals who were born very preterm. We investigated the effect of catechol-O-methyl transferase (COMT) valine (val) 158 methionine (met) (val158met) polymorphism on grey matter development in VPT individuals.

Methods: COMT val108/158met genotype was determined from DNA obtained by cheek swabs in 71 adolescents who were born before 33 gestational weeks (very preterm; VPT). These individuals were part of a long-term follow-up study in which structural MRI had been performed in adolescence. Optimized voxel-based morphometry (VBM) was used to study whole-brain gray matter volumes.

Results: ANOVA (with COMT val108/158met genotype as between-subject factor) showed significant group differences in grey matter volume at 14 years in left middle temporal gyrus and left parietal areas. There was a gradient relationship, with larger volume in met/met homozygotes; smallest volume in val/val homozygotes; and intermediate values in val/met heterozygotes.

Discussion: The met158 allele, which has been extensively studied in relation to prefrontal function, was positively associated with grey matter volume in middle temporal and parietal cortices in VPT individuals. This allele produces a lower-activity form of the enzyme. The COMT met158 allele may moderate vulnerability to the effects of perinatal grey matter damage following very preterm birth.

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Poster 103

INCREASE OF GREY MATTER IN LENTIFORM NUCLEUS IN SCHIZOPHRENIA AND UNAFFECTED RELATIVES MEASURED WITH VOXEL-BASED VOLUMETRY (VBM): MEDICATION EFFECT OR GENETIC LIABILITY?

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Background: We compared morphological pattern of grey and white matter and cerebrospinal fluid, using high-resolution 3D-anatomical MRI imaging data (Siemens Allegra 3 T scanner, Erlangen, Germany), in three different subject groups: 25 schizophrenia (SZ) patients, 29 age-matched first-degree relatives and 37 healthy controls.

Methods: The data were analyzed using voxel-based morphometry (VBM; Ashburner and Friston, 2000, Mechelli et al., 2005) with the SPM5 VBM-tool (SPM5, Wellcome Department of Imaging Neuroscience, London, UK). We added different covariates into the analysis, like age, gender, intracranial volume and years of education. Furthermore, we correlated the imaging data to different psychopathological parameters, like the PANSS scores (Positive and Negative Symptom Scale; Kay et al., 1987), the RHS (Revised Hallucination Scale; Morrison et al., 2002) and the ESI (Eppendorf