

Morphometry of the Corpus Callosum and Regional White Matter Volumes in Families with Schizophrenia

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Why Investigations of White Matter?

- Schizophrenia is associated with disturbances of connectivity [1].
- Aberrant inter-hemispheric connectivity might reflect decreased hemispheric specialisation [2], possibly related to modified cerebral asymmetry
- Reduced corpus callosum (CC) size already reported in a meta-analysis [3].
- Literature on other white matter (WM) measurements in lobar brain region is still very controversial: increase [4], no changes [5], decrease [6].

Why Investigations of Families?

- Inclusion of patients, their healthy relatives, and controls to explore the genetic influence on WM morphology.

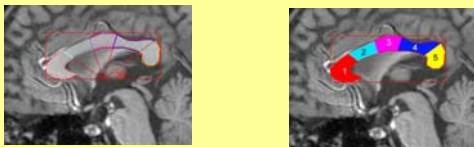
Study Plan

Investigation of CC, its subdivisions and WM of different cerebral regions simultaneously to test

- whether a CC reduction can be replicated
- whether it corresponds to WM in adjacent brain regions
- how it depends from the family type when distinguishing mono- and multiple-affected families.

Planimetric measurement of the corpus callosum (CC)

- midsagittal plane of 1.5 Tesla MRI with 1x1x1 mm voxel size
- subdivision into five sections labelled 1 to 5 rostral-occipital



- CC results were related to the area of the total brain

Results CC:

ANCOVA: factor: status group, covariate: age ($F=3.06$, $p=0.018$)

Subgroup analysis: strongest status group difference:

- \Downarrow {S+F++} vs. {S-F-} ($F=11.72$, $p=0.001$).
 in segments: CC1 ($F=9.12$, $p=0.004$), CC2 ($F=4.45$, $p=0.039$)
 CC4 ($F=4.29$, $p=0.042$), CC5 ($F=4.91$, $p=0.030$)

different family types:

- \Downarrow {F++} vs. {F+} ($F=8.00$, $p=0.005$)
 subgroups: \Downarrow {S-F++} vs. {S-F+} (-5.4%, $F=4.47$, $p=0.038$)
 \Downarrow {S+F++} vs. {S+F+} (-5.5%, $F=6.02$, $p=0.017$)
 in segments: CC1: $F=5.87$, $p=0.019$; CC2: $F=4.56$, $p=0.037$

same family types:

no significant differences between {S-} and {S+}

Conclusion:

Genetic influence on Corpus Callosum size in schizophrenia.

Sample

Recruited regarding two criteria:

- 1.) **Diagnosis:** {S-} individuals **without** schizophrenia
 {S+} individuals **with** schizophrenia
- 2.) **Family type:** {F-} family **not affected** by schizophrenia
 {F+} family **mono-affected**: one individual suffering from schizophrenia
 {F++} family **multiple-affected**: at least two individuals suffering from schizophrenia

\Rightarrow five status groups:

controls: {S-F-}

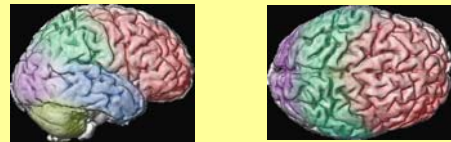
family members: {S-F+}, {S+F+}, {S-F++}, {S+F++}

Demographic Variables

status group	n	Age	Gender (m/w)
{S-F-}	41	32.5 (13.3)	23/18
{S-F+}	31	48.1 (15.0)	16/15
{S+F+}	26	31.0 (6.7)	19/7
{S-F++}	50	41.9 (15.7)	26/24
{S+F++}	31	36.5 (11.7)	19/12

Volumetric WM measurements in different brain regions

- manual segmentation of different structures: prefrontal, posterior part of frontal, parietal, occipital, temporal regions in a subsample of ten MRI data sets related to the cortical surface



- binarisation of the data sets from the various regions
- normalisation, smoothing, and superposition of the binary data, obtain template images of the segmented brain regions
- application of the templates to separate the regions in individual MRI of the entire sample.

\Rightarrow 3D data of GM, WM and CSF separated in regional partitions.

Results WM: MANOVA for factor status group:

prefrontal WM ($F=2.48$, $p=0.046$); occipital WM ($F=3.19$, $p=0.015$)

Subgroup analysis:

\Downarrow {S+F++} vs. {S-F-} prefrontal WM ($F=9.40$, $p=0.003$)

References

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