# Supplementary Materials

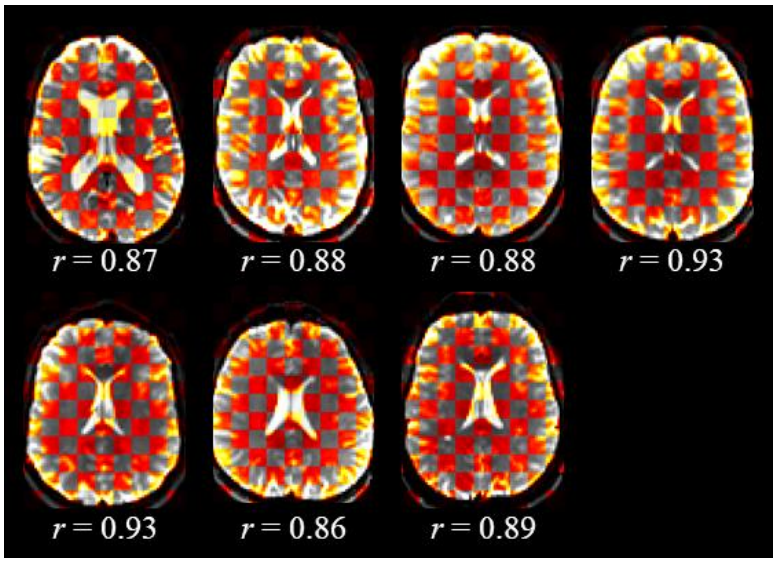


**Figure S1. Assessment of registration between scan and rescan sessions.** For each of the 7 subjects who underwent both scan and rescan sessions, the checkerboard plots of averaged interleaved *b*=0 images are shown. Images from the scan sessions are plotted in gray-white colors, and those from the rescan sessions are plotted in hot colors. The linear correlation coefficients (*r*) between the two images are labelled below each plot.

**Table S1. Intraclass Correlation Coefficients**

| Tracts | FA | $f_r$ | $a$ |
|---|---|---|---|
| Genu of corpus callosum | 0.98 | 0.99 | 0.78 |
| Body of corpus callosum | 0.98 | 0.98 | 0.92 |
| Splenium of corpus callosum | 0.95 | 0.98 | 0.84 |
| Cerebral peduncle R | 0.71 | 0.82 | 0.79 |
| Cerebral peduncle L | 0.92 | 0.87 | 0.63 |
| Anterior limb of internal capsule R | 0.92 | 0.95 | 0.72 |
| Anterior limb of internal capsule L | 0.93 | 0.81 | 0.65 |
| Posterior limb of internal capsule R | 0.91 | 0.98 | 0.91 |
| Posterior limb of internal capsule L | 0.94 | 0.98 | 0.88 |
| Retrolenticular part of internal capsule R | 0.85 | 0.95 | 0.80 |
| Retrolenticular part of internal capsule L | 0.90 | 0.96 | 0.79 |
| Anterior corona radiata R | 0.98 | 0.99 | 0.53 |
| Anterior corona radiata L | 0.93 | 0.98 | 0.73 |
| Superior corona radiata R | 0.95 | 0.89 | 0.91 |
| Superior corona radiata L | 0.87 | 0.95 | 0.87 |
| Posterior corona radiata R | 0.94 | 0.96 | 0.72 |
| Posterior corona radiata L | 0.97 | 0.96 | 0.69 |
| Posterior thalamic radiation (include optic radiation) R | 0.96 | 0.99 | 0.63 |
| Posterior thalamic radiation (include optic radiation) L | 0.81 | 0.99 | 0.68 |
| Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) R | 0.77 | 0.96 | 0.55 |
| Sagittal stratum (include inferior longitudinal fasciculus and inferior fronto-occipital fasciculus) L | 0.75 | 0.97 | 0.68 |
| External capsule R | 0.91 | 0.96 | 0.72 |
| External capsule L | 0.83 | 0.97 | 0.91 |
| Cingulum (cingulate gyrus) R | 0.90 | 0.95 | 0.75 |
| Cingulum (cingulate gyrus) L | 0.93 | 0.96 | 0.67 |
| Fornix (cres) / Stria terminalis (cannot be resolved with current resolution) R | 0.87 | 0.87 | 0.70 |
| Fornix (cres) / Stria terminalis (cannot be resolved with current resolution) L | 0.89 | 0.86 | 0.72 |
| Superior longitudinal fasciculus R | 0.90 | 0.98 | 0.92 |
| Superior longitudinal fasciculus L | 0.83 | 0.98 | 0.65 |
| Uncinate fasciculus R | 0.94 | 0.96 | 0.68 |
| Uncinate fasciculus L | 0.85 | 0.82 | 0.76 |

## Assessment of tract level scan-rescan repeatability using the HCP1065 atlas

The Human Connectome Project HCP1065 standard-space Diffusion Tensor Imaging (DTI) templates (https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/Atlases) was employed to define tract-ROIs. Similarly, the registration was performed using the FMRIB nonlinear image registration tool FNIRT (https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/FNIRT) between the average FA maps of the scan/rescan sessions in the mid-way point space and the template FA maps. The inverse warp was applied on the binary tract-ROIs that are created by thresholding the probabilistic maps at 90%. These ROIs were used to calculated ROI-based statistics of diffusion metrics for tract-wise data analysis.

The repeatability of tract-wise ROI average was assessed in Figure S2. In one subject, less than 10 voxels were found in the mask of the parahippocampal subsection of cingulum, which was then excluded from the analyses, thus this subject contributes 40 data points to the analysis. In all the other subjects, each contributed 41 points (i.e., one data point per tract per subject), yielding a total number of 286 points in the scatterplots. The correlation coefficients and absolute deviations calculated using the HCP1065 atlas are in line with those calculated with the JHU-ICBM atlas.

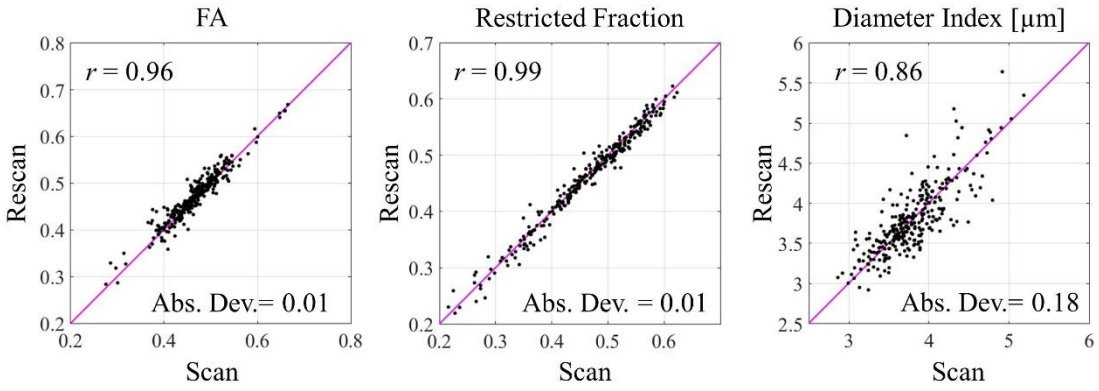


**Figure S2. Tract-wise average estimates of diffusion metrics of scan and rescan sessions.** The plots were generated by pooling together all voxels across all subjects. The Pearson's correlation coefficient ($r$) and absolute deviation (Abs. Dev.) were labeled. The line of unity was marked in pink.

**Table S2. Statistical power calculation for each white matter segment**

| Tracts | Diameter Index | | | | | | Restricted Volume Fraction | | | | | | FA | | | | | | Vol. [$cm^3$] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | μ | σ | Δμ | Δμ/μ [%] | N (5%) | N (10%) | μ | σ | Δμ | Δμ/μ [%] | N (5%) | N (10%) | μ | σ | Δμ | Δμ/μ [%] | N (5%) | N (10%) | |
| CC.g | 3.48 | 0.22 | 0.23 | 6.55 | 25 | 8 | 0.54 | 0.03 | 0.03 | 5.18 | 17 | 5 | 0.63 | 0.04 | 0.04 | 7.11 | 30 | 9 | 8.9 |
| CC.b | 3.85 | 0.28 | 0.29 | 7.61 | 34 | 10 | 0.54 | 0.03 | 0.03 | 5.21 | 17 | 5 | 0.61 | 0.03 | 0.03 | 5.59 | 19 | 6 | 13.7 |
| CC.s | 3.64 | 0.13 | 0.14 | 3.81 | 10 | 4 | 0.58 | 0.03 | 0.04 | 6.10 | 22 | 7 | 0.68 | 0.02 | 0.02 | 2.99 | 7 | 3 | 12.7 |
| CP.R | 3.37 | 0.26 | 0.28 | 8.17 | 39 | 11 | 0.65 | 0.03 | 0.03 | 5.24 | 17 | 6 | 0.73 | 0.02 | 0.03 | 3.43 | 8 | 3 | 2.3 |
| CP.L | 3.38 | 0.26 | 0.28 | 8.16 | 39 | 11 | 0.68 | 0.04 | 0.04 | 6.06 | 22 | 7 | 0.70 | 0.04 | 0.05 | 6.42 | 25 | 7 | 2.3 |
| aIC.R | 3.72 | 0.17 | 0.18 | 4.93 | 15 | 5 | 0.49 | 0.03 | 0.03 | 6.25 | 23 | 7 | 0.55 | 0.03 | 0.04 | 6.47 | 25 | 7 | 3.1 |
| aIC.L | 3.61 | 0.17 | 0.18 | 4.97 | 15 | 5 | 0.50 | 0.02 | 0.03 | 5.26 | 17 | 6 | 0.56 | 0.03 | 0.03 | 4.98 | 15 | 5 | 3.0 |
| pIC.R | 3.93 | 0.15 | 0.16 | 3.98 | 10 | 4 | 0.60 | 0.02 | 0.03 | 4.37 | 12 | 4 | 0.64 | 0.03 | 0.03 | 4.39 | 12 | 4 | 3.8 |
| pIC.L | 3.65 | 0.18 | 0.19 | 5.18 | 16 | 5 | 0.62 | 0.03 | 0.03 | 4.36 | 12 | 4 | 0.65 | 0.03 | 0.03 | 4.83 | 15 | 5 | 3.8 |
| rIC.R | 3.77 | 0.22 | 0.24 | 6.29 | 24 | 7 | 0.50 | 0.02 | 0.02 | 4.70 | 14 | 5 | 0.55 | 0.03 | 0.03 | 5.45 | 18 | 6 | 2.5 |
| rIC.L | 3.60 | 0.16 | 0.17 | 4.85 | 15 | 5 | 0.50 | 0.03 | 0.03 | 5.45 | 18 | 6 | 0.57 | 0.03 | 0.03 | 4.90 | 15 | 5 | 2.5 |
| aCR.R | 3.24 | 0.12 | 0.13 | 3.96 | 10 | 4 | 0.48 | 0.03 | 0.03 | 6.46 | 25 | 7 | 0.41 | 0.02 | 0.02 | 6.06 | 22 | 7 | 6.8 |
| aCR.L | 3.10 | 0.07 | 0.08 | 2.53 | 5 | 3 | 0.50 | 0.03 | 0.03 | 6.75 | 27 | 8 | 0.44 | 0.03 | 0.03 | 6.05 | 22 | 7 | 6.9 |
| sCR.R | 4.23 | 0.34 | 0.36 | 8.41 | 41 | 11 | 0.55 | 0.02 | 0.02 | 4.14 | 11 | 4 | 0.44 | 0.03 | 0.03 | 6.15 | 23 | 7 | 7.5 |
| sCR.L | 3.54 | 0.22 | 0.23 | 6.55 | 25 | 8 | 0.54 | 0.02 | 0.02 | 4.46 | 13 | 5 | 0.45 | 0.02 | 0.02 | 5.31 | 17 | 6 | 7.5 |
| pCR.R | 3.79 | 0.21 | 0.22 | 5.83 | 20 | 6 | 0.50 | 0.03 | 0.03 | 5.90 | 21 | 6 | 0.46 | 0.02 | 0.02 | 5.05 | 16 | 5 | 3.7 |
| pCR.L | 3.74 | 0.22 | 0.24 | 6.36 | 24 | 7 | 0.50 | 0.03 | 0.03 | 5.71 | 20 | 6 | 0.44 | 0.03 | 0.03 | 6.59 | 26 | 8 | 3.7 |
| pThR.R | 3.67 | 0.19 | 0.20 | 5.51 | 18 | 6 | 0.51 | 0.03 | 0.03 | 5.57 | 19 | 6 | 0.54 | 0.03 | 0.03 | 5.19 | 17 | 5 | 4.0 |
| pThR.L | 3.73 | 0.14 | 0.15 | 4.11 | 11 | 4 | 0.49 | 0.03 | 0.03 | 5.56 | 19 | 6 | 0.52 | 0.03 | 0.03 | 5.55 | 19 | 6 | 4.0 |
| sgStra.R | 3.66 | 0.19 | 0.20 | 5.57 | 19 | 6 | 0.47 | 0.02 | 0.02 | 5.11 | 16 | 5 | 0.52 | 0.01 | 0.02 | 2.97 | 7 | 3 | 2.2 |
| sgStra.L | 3.53 | 0.18 | 0.19 | 5.48 | 18 | 6 | 0.46 | 0.02 | 0.02 | 4.30 | 12 | 4 | 0.52 | 0.02 | 0.02 | 4.13 | 11 | 4 | 2.2 |
| EC.R | 3.71 | 0.19 | 0.21 | 5.55 | 19 | 6 | 0.38 | 0.03 | 0.03 | 6.99 | 29 | 8 | 0.44 | 0.02 | 0.02 | 5.42 | 18 | 6 | 5.6 |
| EC.L | 3.43 | 0.16 | 0.17 | 4.88 | 15 | 5 | 0.39 | 0.02 | 0.03 | 6.40 | 24 | 7 | 0.46 | 0.02 | 0.03 | 5.61 | 19 | 6 | 5.6 |
| Cing.R | 3.82 | 0.27 | 0.29 | 7.58 | 34 | 10 | 0.46 | 0.04 | 0.04 | 8.64 | 43 | 12 | 0.47 | 0.03 | 0.03 | 7.37 | 32 | 9 | 2.3 |
| Cing.L | 3.93 | 0.32 | 0.34 | 8.67 | 43 | 12 | 0.46 | 0.03 | 0.04 | 7.92 | 37 | 10 | 0.51 | 0.03 | 0.04 | 6.93 | 28 | 8 | 2.8 |
| Fnx.R | 3.91 | 0.18 | 0.19 | 4.85 | 15 | 5 | 0.43 | 0.04 | 0.04 | 9.62 | 53 | 14 | 0.56 | 0.05 | 0.06 | 9.81 | 55 | 15 | 1.1 |
| Fnx.L | 3.74 | 0.22 | 0.23 | 6.19 | 23 | 7 | 0.49 | 0.04 | 0.04 | 8.54 | 42 | 12 | 0.61 | 0.03 | 0.04 | 5.75 | 20 | 6 | 1.1 |
| SLF.R | 3.87 | 0.20 | 0.21 | 5.45 | 18 | 6 | 0.55 | 0.03 | 0.03 | 5.51 | 18 | 6 | 0.46 | 0.02 | 0.02 | 3.88 | 10 | 4 | 6.6 |
| SLF.L | 3.43 | 0.17 | 0.18 | 5.11 | 16 | 5 | 0.56 | 0.03 | 0.03 | 4.91 | 15 | 5 | 0.46 | 0.02 | 0.02 | 4.44 | 13 | 4 | 6.6 |
| UF.R | 3.84 | 0.26 | 0.27 | 7.08 | 30 | 9 | 0.31 | 0.03 | 0.04 | 11.26 | 72 | 19 | 0.45 | 0.03 | 0.03 | 6.22 | 23 | 7 | 0.4 |
| UF.L | 3.53 | 0.30 | 0.32 | 9.11 | 48 | 13 | 0.32 | 0.02 | 0.02 | 6.26 | 23 | 7 | 0.45 | 0.04 | 0.05 | 10.50 | 63 | 17 | 0.4 |

**Abbreviations**: μ: sample mean, σ: standard deviation, Δμ: minimum effect size detectable assuming N=20 in both group of interest and control group, Δμ/μ [%]: relative effect size in percentile, N (5%): number of participants needed to identify a 5% effect size in sample mean, N (10%): number of participants needed to identify a 10% effect size in sample mean, Vol. [$cm^3$]: volume of the ROI in $cm^3$; CC.g: genu of Corpus Callosum, CC.b: body of Corpus Callosum, CC.s: splenium of Corpus Callosum, CP.R: Cerebral Peduncle R, CP.L: Cerebral Peduncle L, aIC.R: anterior limb of Internal Capsule R, aIC.L: anterior limb of Internal Capsule L, pIC.R: posterior limb of Internal Capsule R, pIC.L: posterior limb of Internal Capsule L, rIC.R: retrolenticular part of Internal Capsule R, rIC.L: retrolenticular part of Internal Capsule L, aCR.R: anterior Corona Radiata R, aCR.L: anterior Corona Radiata L, sCR.R: superior Corona Radiata R, sCR.L: superior Corona Radiata L, pCR.R: posterior Corona Radiata R, pCR.L: posterior Corona Radiata L, pThR.R: posterior Thalamic Radiation R, pThR.L: posterior Thalamic Radiation L, sgStra.R: sagittal Stratum R, sgStra.L: sagittal Stratum L, EC.R: External Capsule R, EC.L: External Capsule L, Cing.R: Cingulum (cingulate gyrus) R, Cing.L: Cingulum (cingulate gyrus) L, Fnx.R: Fornix (cres) / stria terminalis R, Fnx.L: Fornix (cres) / stria terminalis L, SLF.R: Superior Longitudinal Fasciculus R, SLF.L: Superior Longitudinal Fasciculus L, UF.R: Uncinate Fasciculus R, UF.L: Uncinate Fasciculus L.

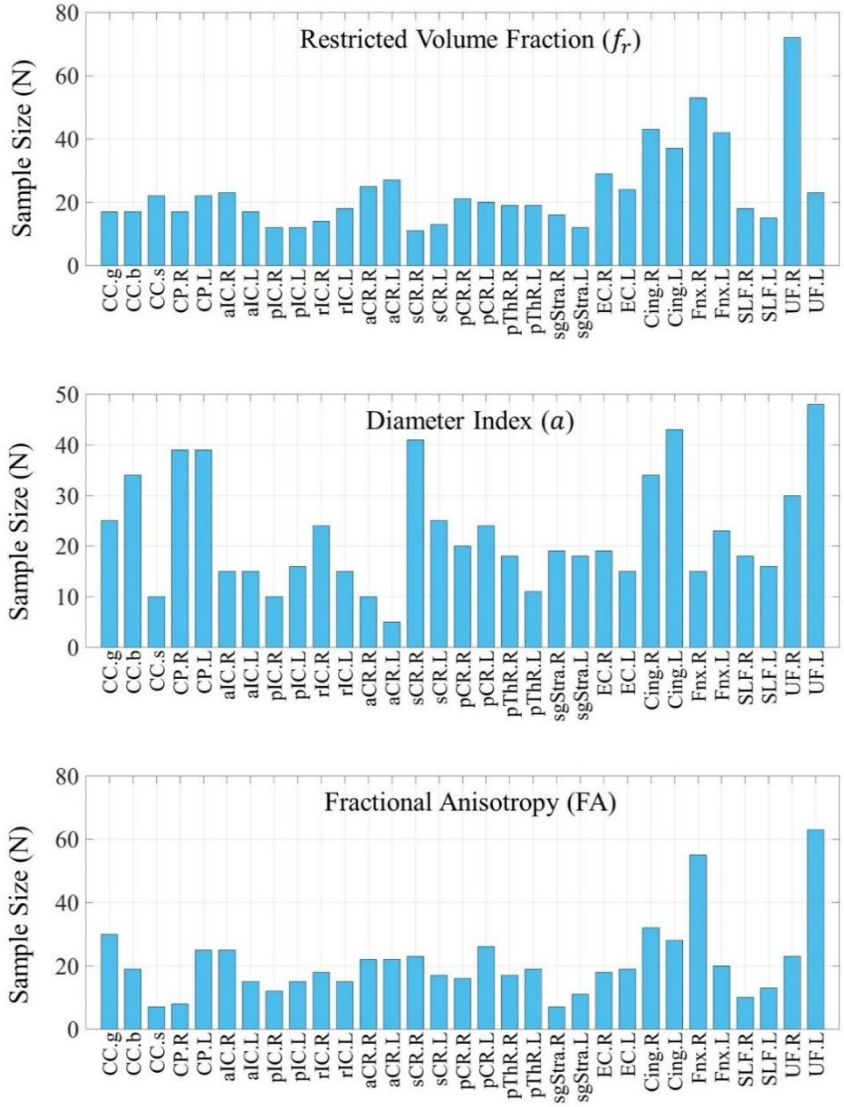


**Figure S3. Estimation on the number of participants needed for different regions in the cerebral white matter.** The calculation was based on the group mean and standard deviation in a cohort of 15 healthy adults, estimated to reach a significance level of $\boldsymbol{\alpha}$ = 0.05 to tell a 5% effect size with a statistical power of 0.8. The abbreviations for ROI names are the same as listed in Table S2.