

Supplementary material

Gray matter abnormalities in sight deprivation and sight restoration

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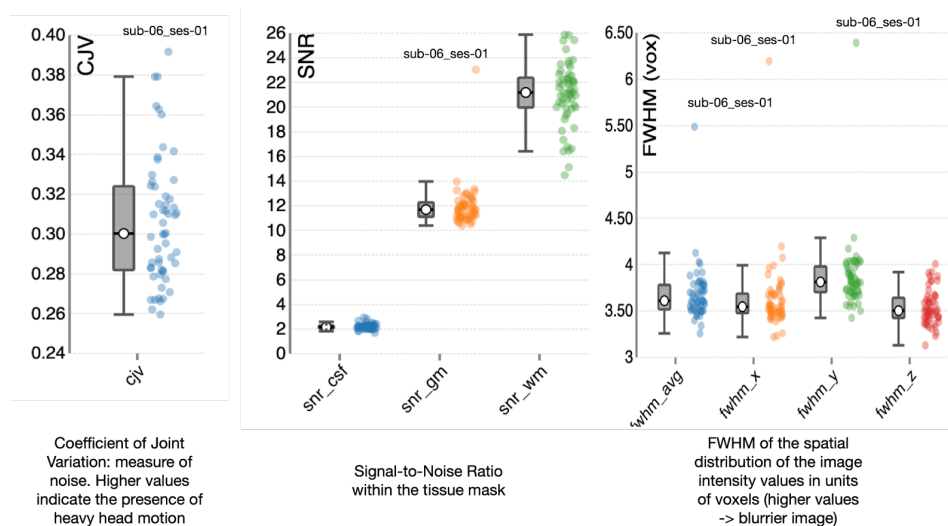


Fig. S1. Section of the report of structural images quality from MRIQC.

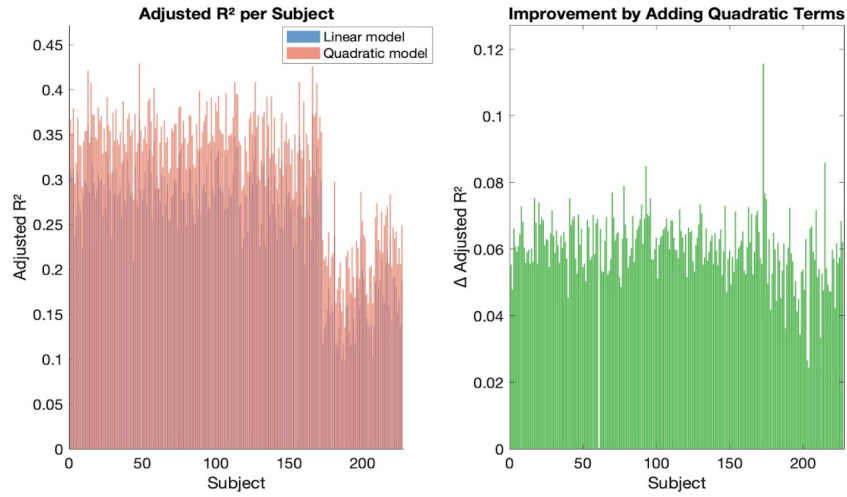


Fig. S2. Nonlinear effects when modeling T1-weighted signal intensity. Left: Adjusted R² for linear and linear + quadratic models. Right: Per- subject improvement by adding quadratic terms.

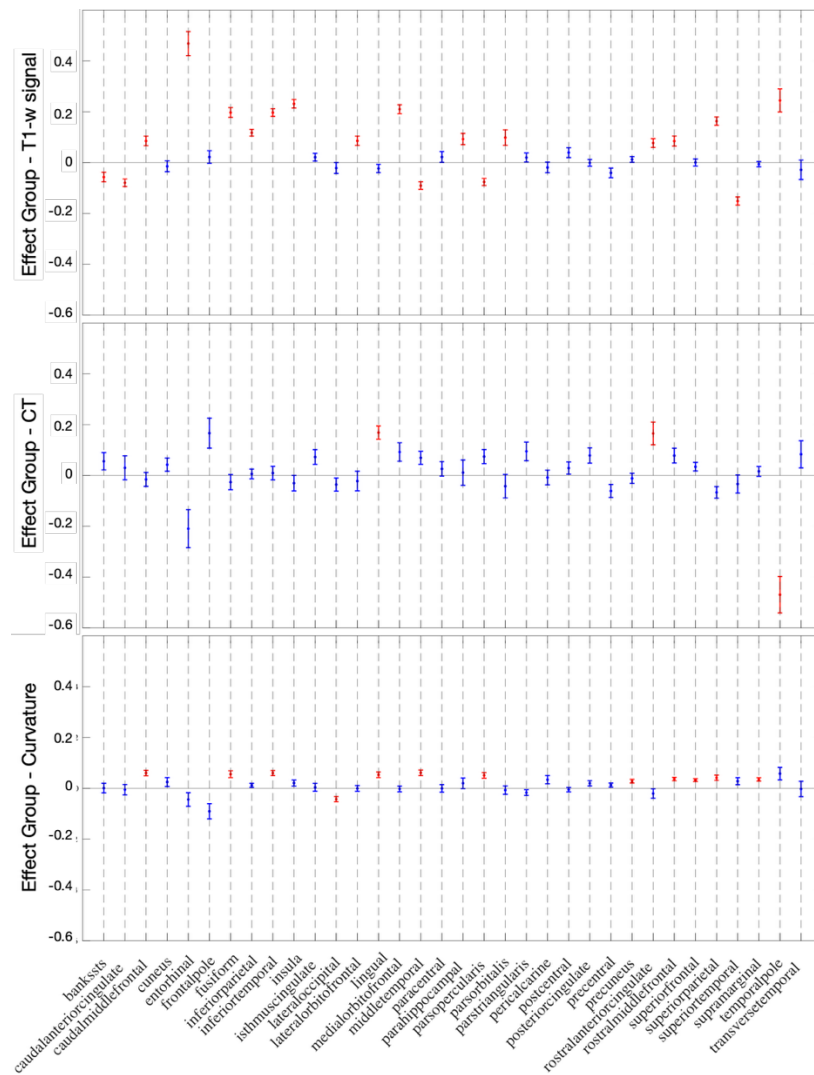


Fig. S3. Effect of group at ROI-level. Betas representing the group effect for T1-w signal intensity, cortical thickness, and curvature across different ROIs. Red bars indicate significant results, while blue bars denote non-significant findings. Error bars represent the standard error around each beta estimate.

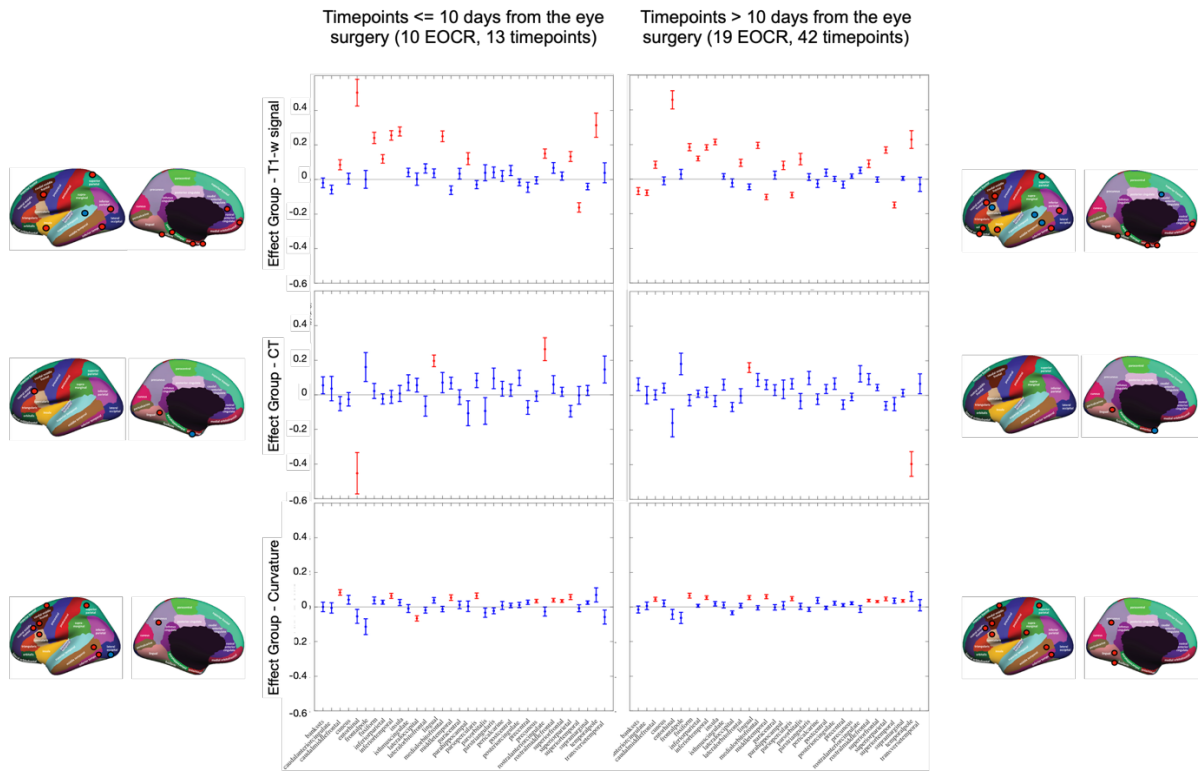


Fig. S4. Effect of group at ROI-level including only timepoints around the surgery (left column) or significantly after the surgery (right column). Central columns – Betas representing the group effect for T1-weighted signal intensity, cortical thickness, and curvature across different ROIs. Red bars indicate significant results, while blue bars denote non-significant findings. Error bars represent the standard error around each beta estimate. Lateral columns – Visualization of the Desikan-Killiany ROIs on medial and lateral brain surfaces. Red dots highlight regions with significantly higher betas in EOGR individuals, whereas blue dots indicate regions with significantly higher betas in NSC.

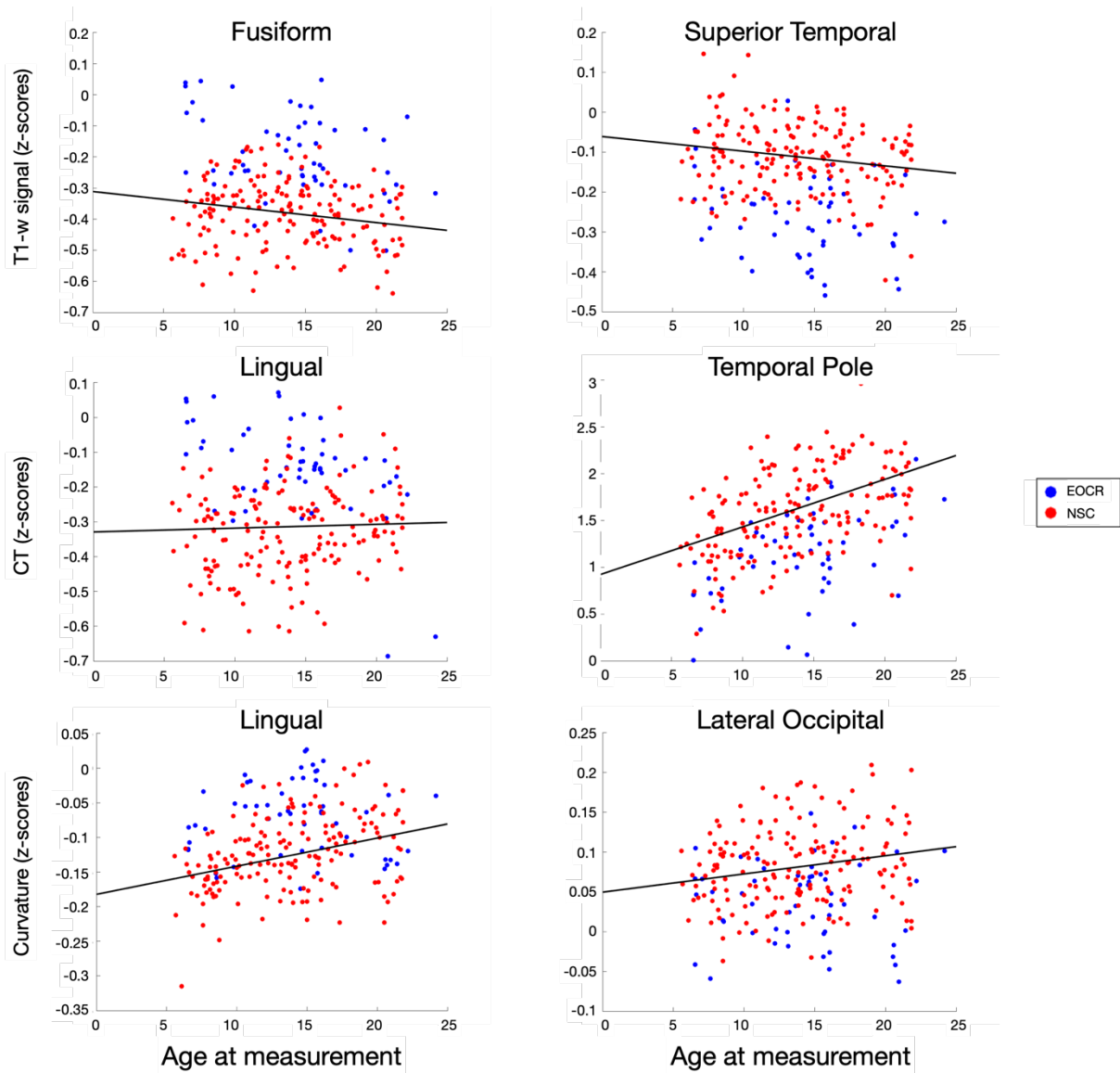


Fig. S5. T1-w signal, CT and Curvature as a function of age. For each structural metric, we selected two representative regions of interest (ROIs) and represent the trend of the structural metric as a function of age, for each group (EOCR in blue and NSC in red). Left panel: Regions with higher z-scores in early-onset cataract-reversal (EOCR) individuals compared to normally sighted controls (NSC). Right panel: Regions with higher z-scores in NSC compared to EOCR. The black line in each plot represents the age-related effect (beta coefficient) on each measure.

In Fig. S6, we illustrate the pattern of changes in T1-w signal as a function of age within the regions of interest (ROI) where we observed a significant effect ($\text{FDR-}p < 0.01$). Research indicates that absolute T1-w signal trends typically follow an inverted U-shaped pattern: younger individuals (approximately 20 years old) exhibit lower T1-w signals, which stabilize around ages 40 to 50 before beginning to decline again (Rowley et al., 2017). However, data on individuals aged 0 to 20 years are limited. Importantly, we are utilizing z-scores, which emphasize effects relative to the mean rather than absolute changes. This approach allows us to identify ROI-specific effects that may not be apparent when examining general trends of absolute values.

Regarding our results, the dorsal locations align with the overall observation of an increasing T1-w signal with age. Since our sample does not extend into the stabilization phase (40-50 years), we only observe the initial increase. In contrast, the ventral location displays a decreasing trend in T1-w signal with age. Given that we are analyzing relative signals, this decrease could indicate a relative decline within the context of an overall absolute increase in T1-w signals, or it may signify a decrease in absolute terms altogether. In conclusion, our findings represent an initial step toward bridging the knowledge gap regarding T1-w signals in individuals aged 0 to 20 years.

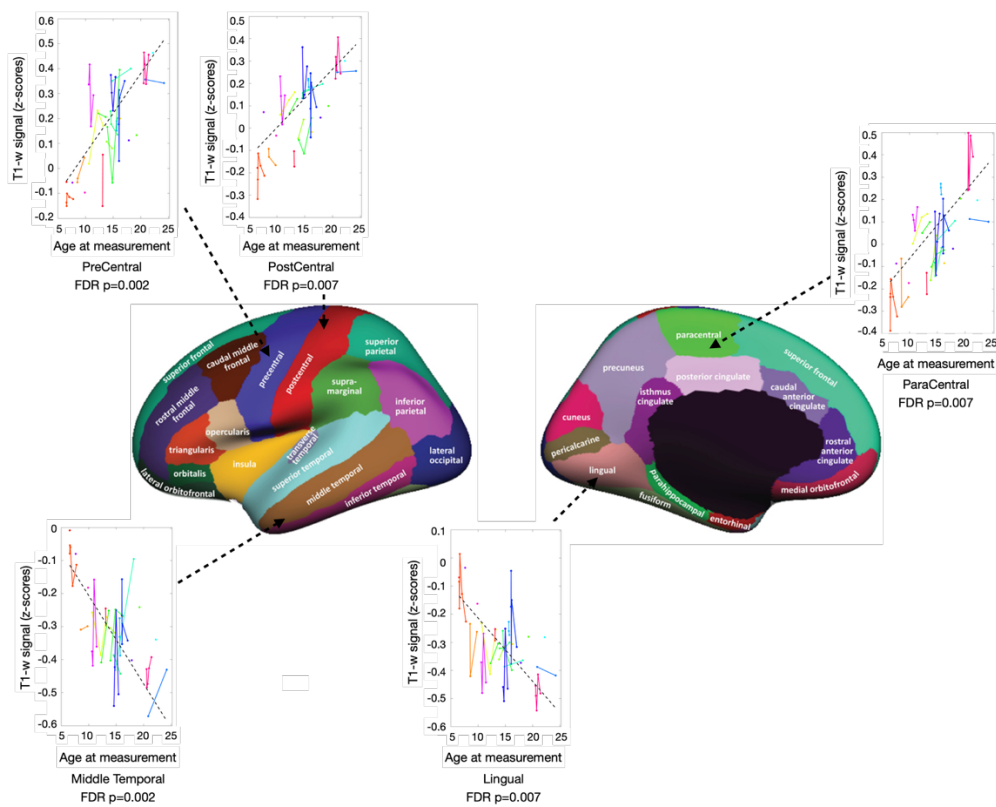


Fig. S6. Effect of age at ROI-level in the group of individuals who have been treated for dense bilateral congenital cataract. Lateral and medial brain surface superimposed with the Desikan-Killiany Atlas. Each plot represents z-scores T1-w signal for each subject as a function of age. Each color represents an EOCR, and each line is connecting the multiple timepoints from the same subject. The dashed line indicates the beta extracted from the linear mixed-effect model, with the random-intercept of subjects. The plots have been chosen based on the ROIs reporting significant results after FDR correction.

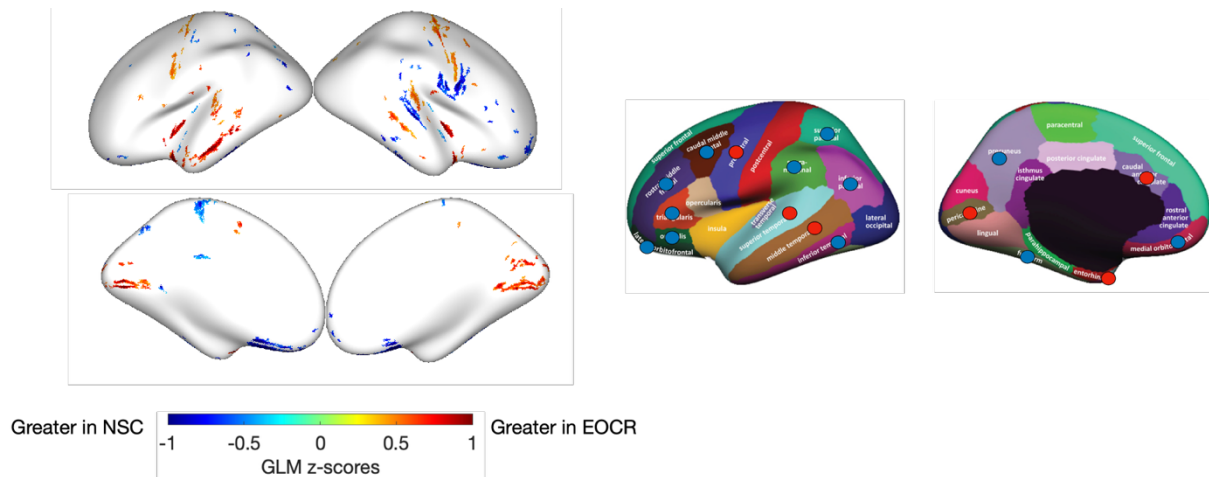


Fig. S7. Local Gyrification Index - Effect of group at whole-brain (left) and ROI-level (right) on a brain surface. Left: Cold colors represent z-scores greater in normally sighted controls (NSC); warm colors represent z-scores greater in early-onset cataract-reversal (EOCR) participants. Results are shown without applying any smoothing. Results are significant after cluster correction (vertex-wise cluster threshold of 3 and a cluster-wise p-threshold set to 0.05). Right: Visualization of the Desikan-Killiany ROIs on medial and lateral brain surfaces. Red dots highlight regions with significantly greater values in EOCR, whereas blue dots indicate regions with significantly greater values in NSC.

Reference

Rowley, C. D., Sehmbi, M., Bazin, P.-L., Tardif, C. L., Minuzzi, L., Frey, B. N., & Bock, N. A. (2017). Age-related mapping of intracortical myelin from late adolescence to middle adulthood using T1 -weighted MRI. *Human Brain Mapping*, 38(7), 3691–3703. <https://doi.org/10.1002/hbm.23624>