

Supplementary Material

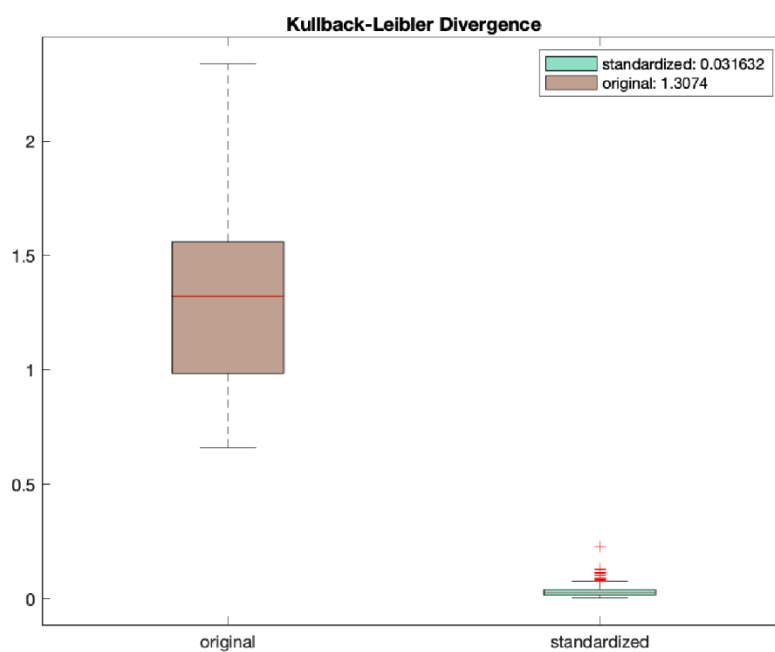


Figure S6: KL-Divergence between volume histograms in the original (left) and standardized images (right).

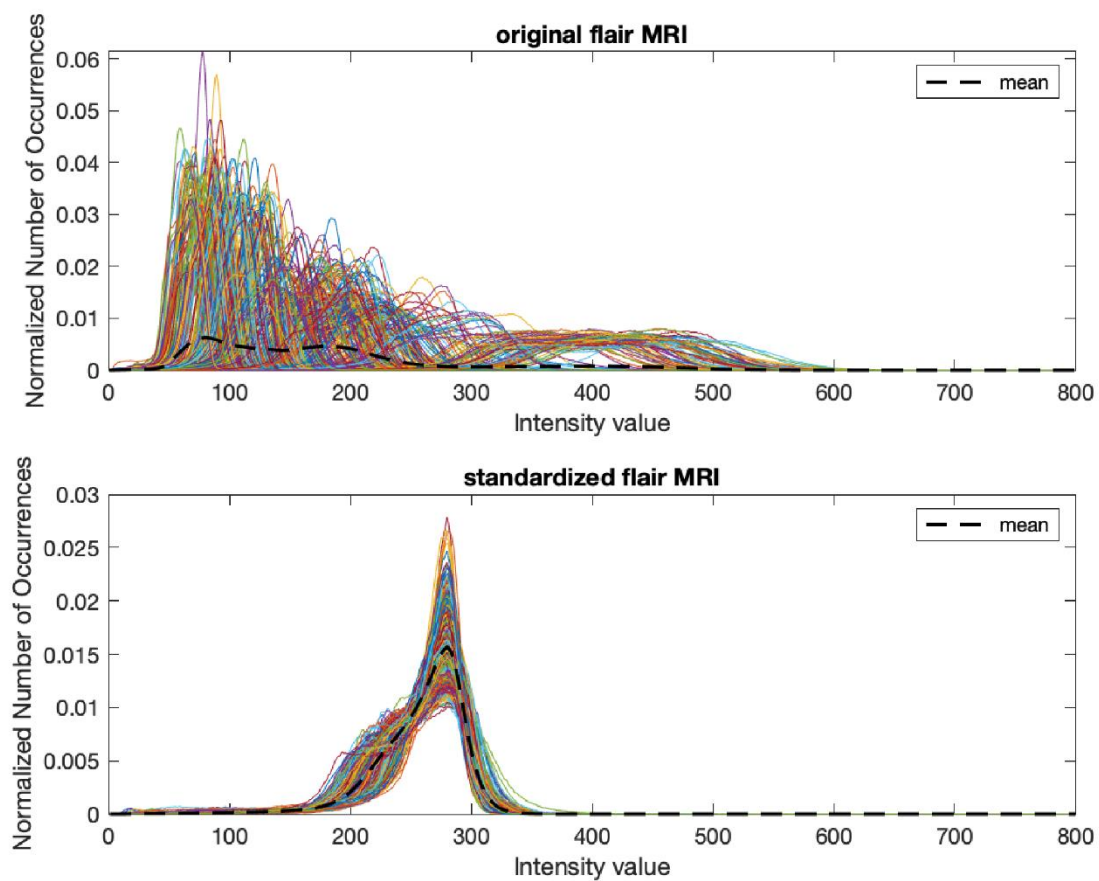


Figure S7: FLAIR intensity histograms of cohort of original and standardized FLAIR images.

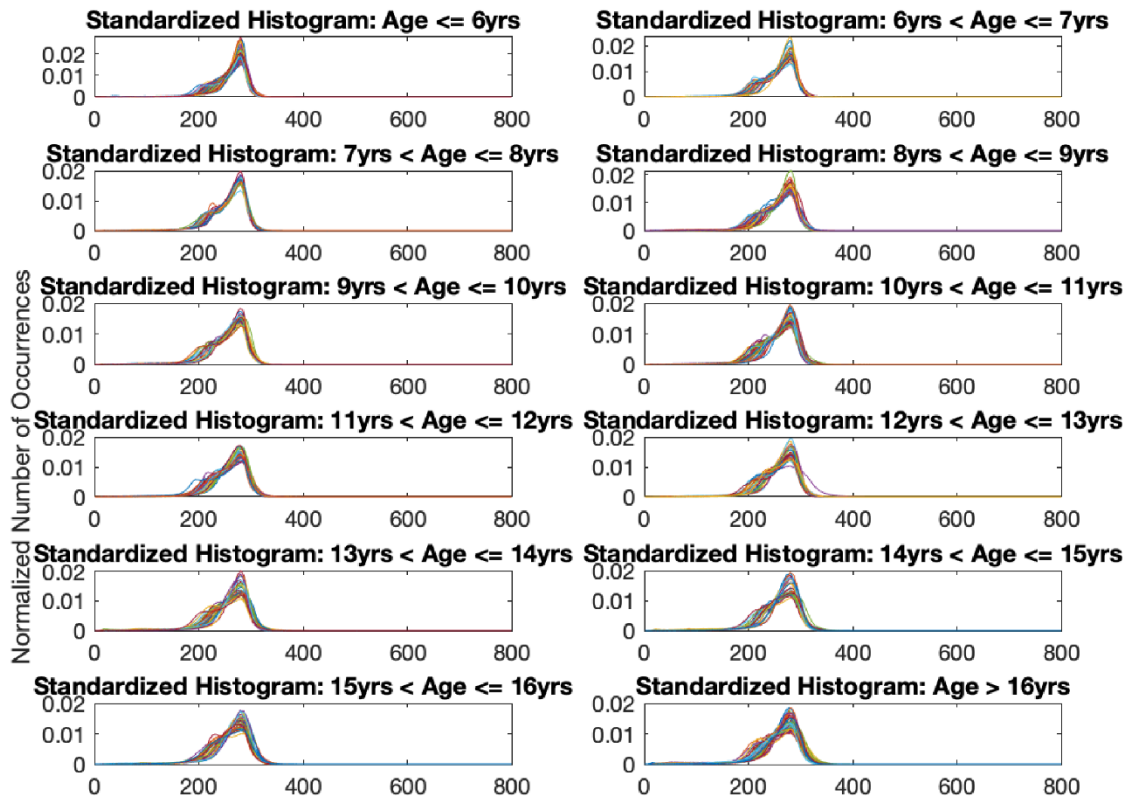


Figure S8: FLAIR MRI intensity histograms of subjects in a variety of age ranges.

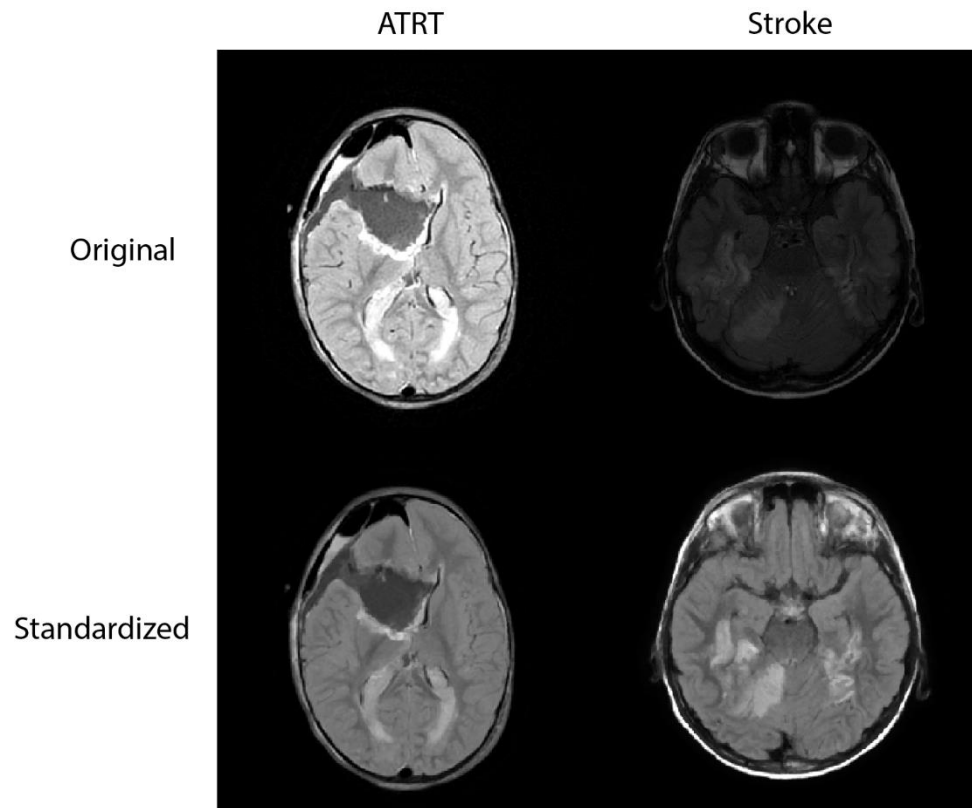


Figure S9: FLAIR standardization framework applied to two pathological brains, one with an atypical teratoid rhabdoid tumor (ATRT) (first column) and another with a stroke infarct (second column). Original images are shown in the top row to be drastically different in intensity, while the standardized images in the bottom row demonstrate the utility of standardization in comparing pathological images.

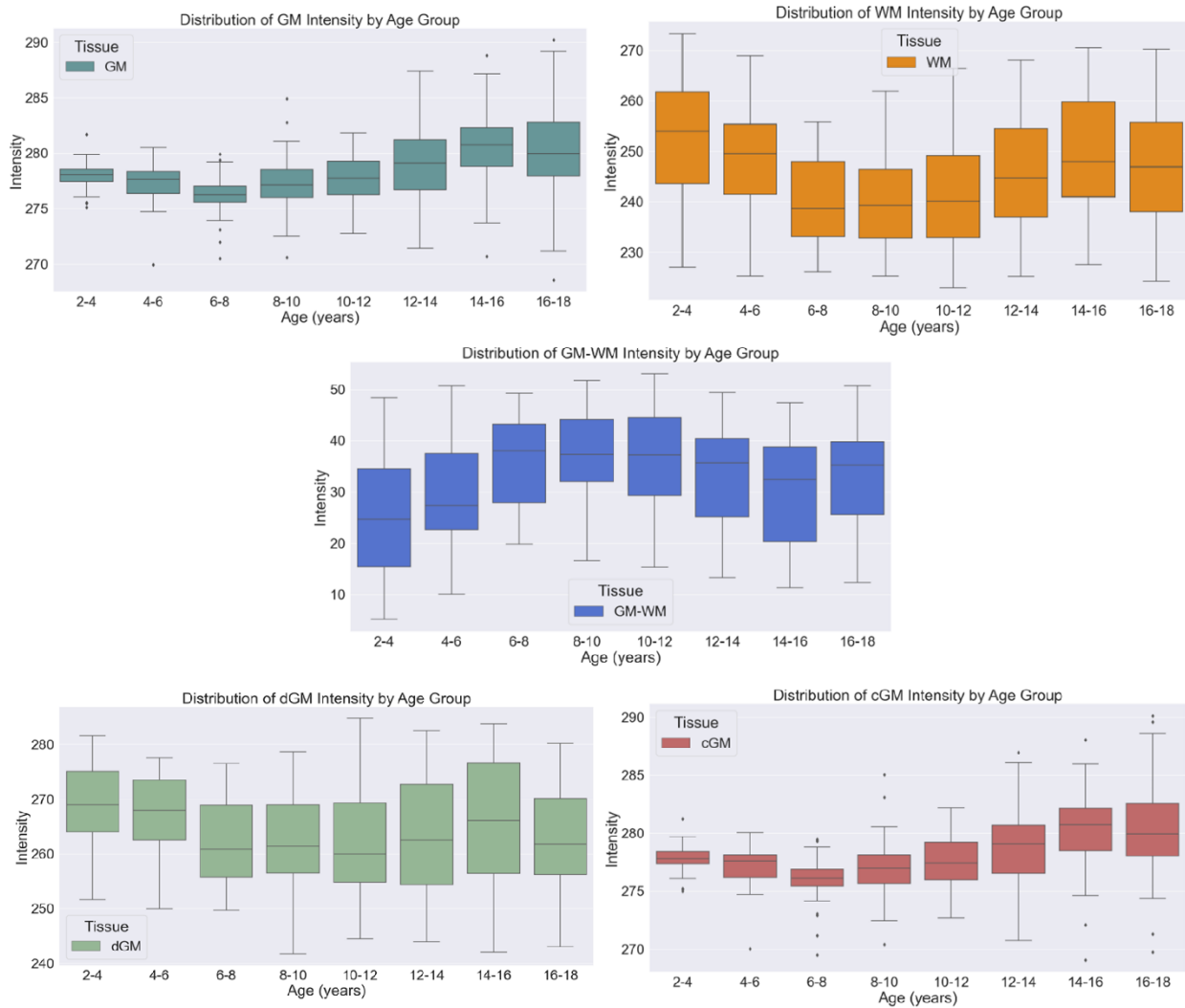


Figure S10: Differences in GM and WM mean intensities across the pediatric age range of 429 children.

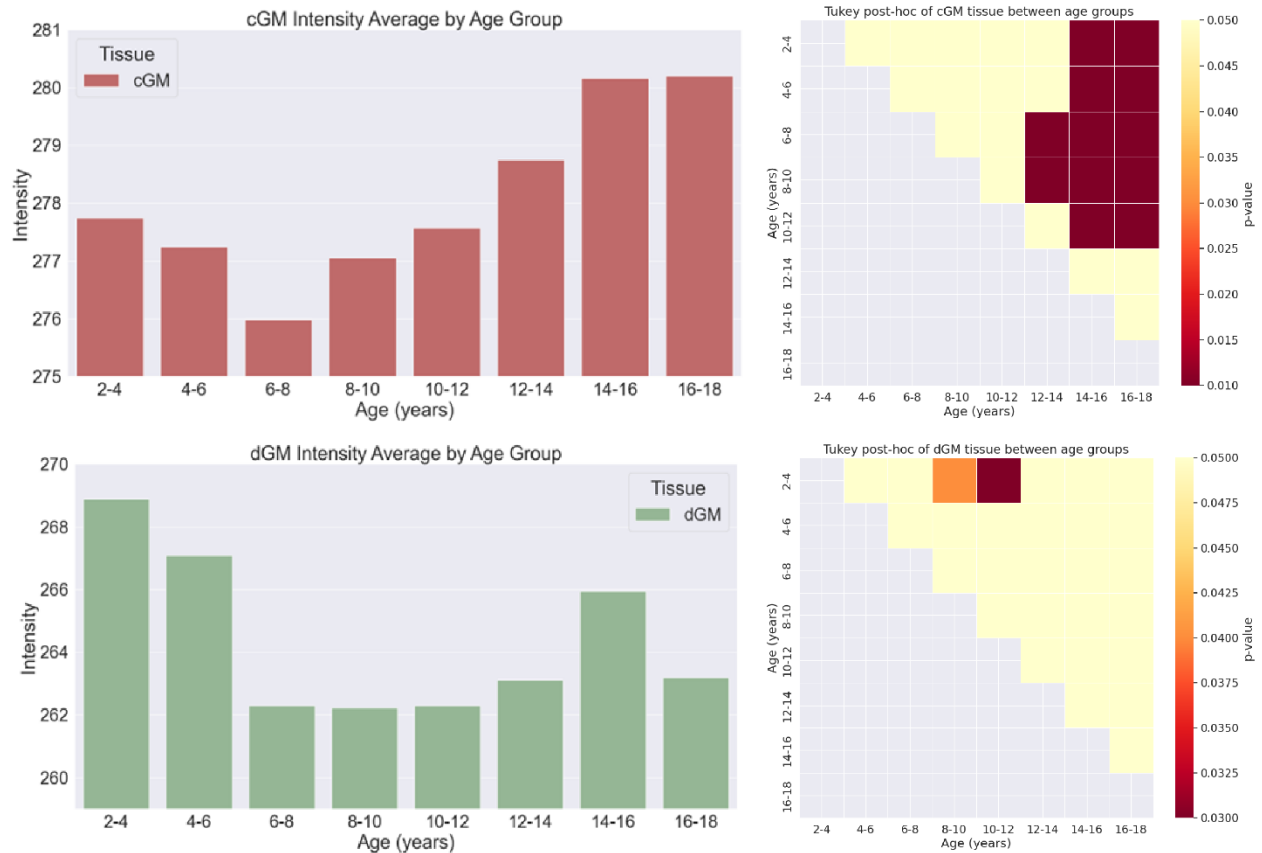


Figure S11: Mean intensity (left) and p-value heatmap for intensity comparison for two age groups (right) for cGM (top) and dGM (bottom).

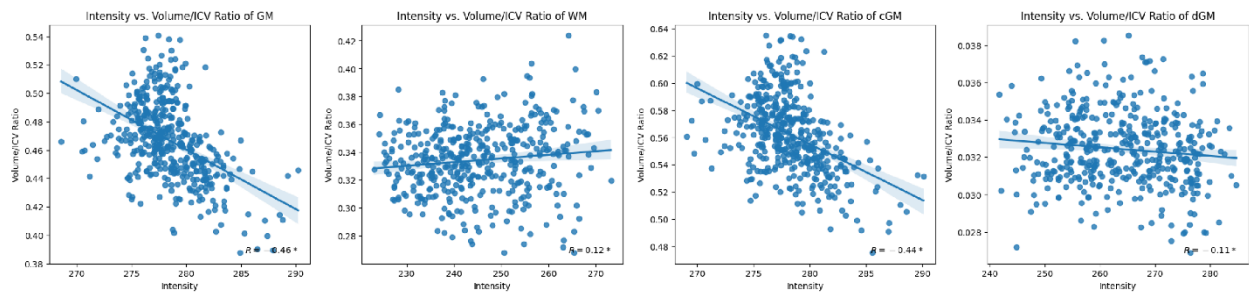


Figure S12: FLAIR intensity vs. volume for 429 pediatric subjects for different tissue regions.

Table S2: Mean intensity biomarkers for different regions, shown as a function of age.

Age range (months)	WM	GM	GM-WM	cGM	dGM
24-48	252 +/- 11.0	278 +/- 1.4	26 +/- 11.2	278 +/- 1.4	269 +/- 7.0
48-72	249 +/- 10.3	277 +/- 1.8	29 +/- 10.3	277 +/- 1.7	267 +/- 7.6
72-96	240 +/- 8.8	276 +/- 1.9	36 +/- 8.8	276 +/- 2.2	262 +/- 7.3
96-120	240 +/- 9.2	277 +/- 2.3	37 +/- 8.2	277 +/- 2.3	262 +/- 9.0
120-144	241 +/- 10.2	278 +/- 2.2	36 +/- 9.0	278 +/- 2.2	262 +/- 9.5
144-168	245 +/- 10.7	279 +/- 3.1	34 +/- 9.4	279 +/- 3.0	263 +/- 11.0
168-192	250 +/- 11.4	280 +/- 3.1	30 +/- 10.1	280 +/- 3.1	266 +/- 11.0
192-218	247 +/- 10.8	280 +/- 4.2	33 +/- 9.4	280 +/- 4.1	263 +/- 9.6

Table S3: Standard errors and p-value of regression fits for each tissue type.

MALE					
	WM	GM	GM-WM	cGM	dGM
Standard Error	x1 = 0.931	x1 = 0.233	x1 = 0.864	x1 = 0.232	x1 = 0.805
	x2 = 0.046	x2 = 0.011	x2 = 0.042	x2 = 0.011	x2 = 0.039
p-value	0.000243	2.23e-05	6.71e-05	9.91e-06	0.0103
FEMALE					
	WM	GM	GM-WM	cGM	dGM
Standard Error	x1 = 0.866	x1 = 0.232	x1 = 0.769	x1 = 0.229	x1 = 0.803
	x2 = 0.040	x2 = 0.011	x2 = 0.036	x2 = 0.011	x2 = 0.037
p-value	1.58e-07	2.24e-15	5.89e-05	5.78e-16	0.0301

Table S4: ANOVA Test Results comparing intensity over all age ranges for different tissues

	WM	GM	GM-WM	cGM	dGM
p value	<0.001	<0.001	<0.001	<0.001	0.003

Table S5: WM Tukey Test for FLAIR intensity across age groups (months).

	24-48	48-72	72-96	96-120	120-144	144-168	168-192	192-218
24-48		0.89	< 0.01	< 0.01	< 0.01	0.07	0.99	0.45
48-72	0.89		< 0.01	< 0.01	0.01	0.76	0.10	0.10
72-96	< 0.01	< 0.01		1.00	0.10	0.19	< 0.01	0.03
96-120	< 0.01	< 0.01	1.00		0.10	0.09	< 0.01	0.01
120-144	< 0.01	0.01	0.10	0.10		0.35	< 0.01	0.06
144-168	0.07	0.76	0.19	0.09	0.35		0.13	0.99
168-192	0.99	0.10	< 0.01	< 0.01	< 0.01	0.13		0.74
192-218	0.45	0.10	0.03	0.01	0.06	0.99	0.74	

Table S6: GM Tukey Test for FLAIR intensity across age groups (months).

	24-48	48-72	72-96	96-120	120-144	144-168	168-192	192-218
24-48		0.99	0.16	0.98	1.00	0.66	< 0.01	< 0.01
48-72	0.99		0.54	1.00	0.10	0.08	< 0.01	< 0.01
72-96	0.16	0.54		0.45	0.08	< 0.01	< 0.01	< 0.01
96-120	0.98	1.00	0.45		0.99	0.02	< 0.01	< 0.01
120-144	1.00	0.10	0.08	0.99		0.14	< 0.01	< 0.01
144-168	0.66	0.08	< 0.01	0.02	0.14		0.06	0.15
168-192	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06		1.00
192-218	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.15	1.00	

Table S7: GM-WM Tukey Test for FLAIR intensity across age groups (months).

	24-48	48-72	72-96	96-120	120-144	144-168	168-192	192-218
24-48		0.93	< 0.01	< 0.01	< 0.01	0.01	0.45	0.02
48-72	0.93		0.01	< 0.01	< 0.01	0.17	0.99	0.33
72-96	< 0.01	0.01		0.10	1.00	0.90	0.04	0.84
96-120	< 0.01	< 0.01	0.10		0.10	0.39	< 0.01	0.33
120-144	< 0.01	< 0.01	1.00	0.10		0.71	< 0.01	0.63
144-168	0.01	0.17	0.90	0.39	0.71		0.41	1.00
168-192	0.45	0.99	0.04	< 0.01	< 0.01	0.41		0.67
192-218	0.02	0.33	0.84	0.33	0.63	1.00	0.67	

Table S8: cGM Tukey Test for FLAIR intensity across age groups (months).

	24-48	48-72	72-96	96-120	120-144	144-168	168-192	192-218
24-48		1.00	0.13	0.95	1.00	0.70	< 0.01	< 0.01
48-72	1.00		0.42	1.00	1.00	0.12	< 0.01	< 0.01
72-96	0.13	0.42		0.52	0.06	< 0.01	< 0.01	< 0.01
96-120	0.95	1.00	0.52		0.96	0.01	< 0.01	< 0.01
120-144	1.00	1.00	0.06	0.96		0.18	< 0.01	< 0.01
144-168	0.70	0.12	< 0.01	0.01	0.18		0.05	0.08
168-192	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05		1.00
192-218	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.08	1.00	

Table S9: dGM Tukey Test for FLAIR intensity across age groups (months).

	24-48	48-72	72-96	96-120	120-144	144-168	168-192	192-218
24-48		0.99	0.07	0.04	0.03	0.10	0.85	0.15
48-72	0.99		0.31	0.20	0.17	0.42	1.00	0.52
72-96	0.07	0.31		1.00	1.00	1.00	0.51	1.00
96-120	0.04	0.20	1.00		1.00	1.00	0.34	1.00
120-144	0.03	0.17	1.00	1.00		1.00	0.30	1.00
144-168	0.10	0.42	1.00	0.10	1.00		0.66	1.00
168-192	0.85	0.10	0.51	0.34	0.30	0.66		0.76
192-218	0.15	0.52	1.00	0.10	1.00	1.00	0.76	

Table S10: ANOVA p-values comparing male and female intensity in different age groups.

Age range (months)	WM	GM	GM-WM	cGM	dGM
24-48	0.97	0.36	0.87	0.31	0.75
48-72	0.67	0.83	0.64	0.70	0.99
72-96	0.51	0.84	0.47	0.72	0.82
96-120	0.83	0.48	0.96	0.50	0.79
120-144	0.58	0.85	0.50	0.83	0.40
144-168	0.64	0.36	0.40	0.36	0.95
168-192	0.73	0.32	0.50	0.30	0.87
192-218	0.09	0.06	0.27	0.05	0.86

FIGURE LEGENDS

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