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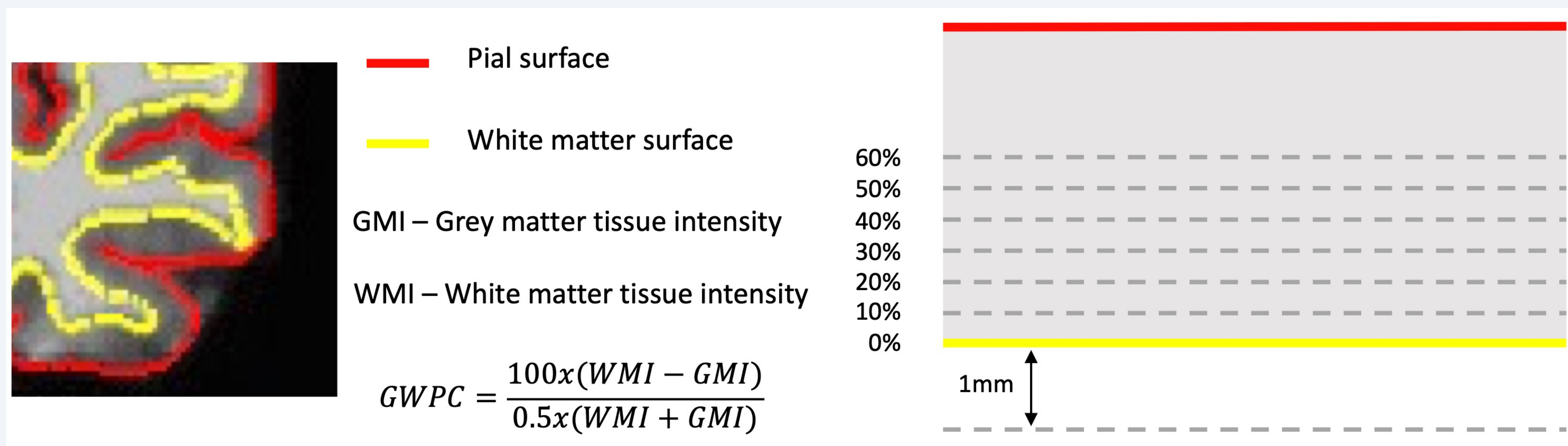
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## Introduction

- Very preterm birth (<32 weeks of gestation) is associated with altered brain development and an increased risk for cognitive deficits (Wolke, Johnson, and Mendonça 2019)
- Alterations of macrostructural cortical architecture after preterm birth persist into adulthood and mediate lasting intelligence quotient (IQ) deficits (Schmitz-Koep et al. 2020)
- Microstructural cortical organization remains unclear
- Percent contrast of grey-to-white matter signal intensities (GWPC) in brain structural MRI is an in vivo proxy measure for irregular cortical microstructure (Andrews et al. 2017)

## Methods

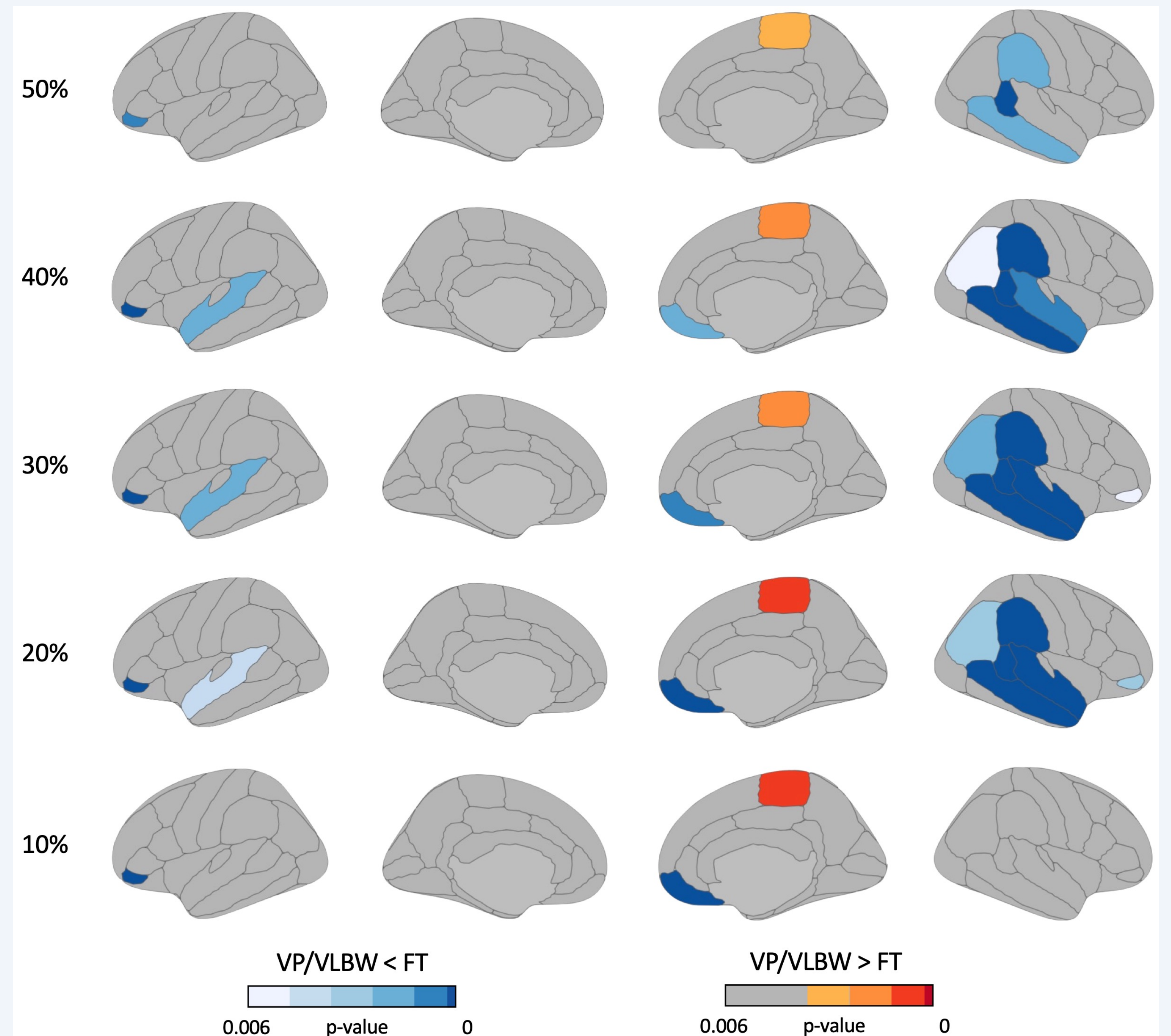
- 86 very preterm-born (<32 weeks of gestation and/or birth weight <1500g, VP/VLBW) adults and 103 full-term (FT) controls at 26 years of age
- Structural MRI (T1w, 3T), FreeSurfer v7.1.1 analysis
- Grey matter tissue intensities (GMI) sampled at different percentile fractions of the total orthogonal distance projected from the white matter surface to the pial surface (0%, 10%, 20%, 30%, 40%, 50%, and 60%), white matter signal intensity (WMI) sampled at 1.0 mm into the white matter from the white matter surface
- ROI-based (Desikan-Killiany atlas)
- ComBat (correction for scanner effects, Fortin et al. 2018)
- General linear models with sex as factor of no interest, false discovery rate (FDR) corrected, for group comparison
- Two-tailed partial correlation analyses within the VP/VLBW group, sex as covariate of no interest, for relationship with GA, BW, ventilation, and full-scale IQ



## Results

	VP/VLBW (n=86)			FT (n=103)			p-value
	Mean/n	SD	Range	Mean/n	SD	Range	
Sex (male/female)	48/38			60/43			0.736
Age (years)	26.8	± 0.6	25.7 – 28.3	26.8	± 0.7	25.5 – 28.9	0.247
GA (weeks)	30.6	± 2.2	25 – 36	39.7	± 1.1	37 – 42	<0.001
BW (g)	1328	± 316	630 – 2000	3402	± 451	2120 – 4670	<0.001
Ventilation (days)	11.4	± 17.1	0 – 81	n.a.	n.a.	n.a.	n.a.
Full-scale IQ (a.u.)	94.0	± 12.8	64 – 131	102.3	± 11.9	77 – 130	<0.001

- GWPC was significantly ( $p < 0.05$ , FDR-corrected) lower in VP/VLBW adults in frontal, parietal, and temporal associative cortices, predominantly in the right hemisphere
- Differences pronounced at 20%, 30%, and 40%, hence, in middle cortical layers
- GWPC was significantly higher in right paracentral lobule in VP/VLBW adults
- Differential effects on associative and primary cortices
- GWPC in frontal and temporal cortices was positively correlated with BW, and negatively with duration of ventilation ( $p < 0.05$ )
- GWPC in right paracentral lobule was negatively correlated with IQ ( $p < 0.05$ )



## Conclusion

Widespread aberrant GWPC suggests lastingly altered cortical microstructure after preterm birth, mainly in middle cortical layers, with differential effects on associative and primary cortices.

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Schmitz-Koep B, Menegaux A, Zimmermann J, et al. Altered gray-to-white matter tissue contrast in preterm-born adults. *CNS Neurosci Ther* 2023; 00:1-13. doi:10.1111/cns.14320.

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