

## Reduced thalamo-cortical connectivity at term is associated with impaired cognition in children who were born preterm

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### Aims

The high incidence of neurocognitive impairment observed in children who were born preterm may be associated with altered brain development detected using quantitative magnetic resonance (MR) imaging. We have previously shown that thalamo-cortical connectivity is impaired in preterm infants at term equivalent age (1). The aim of this study was to assess whether thalamo-cortical connectivity in the preterm brain at term equivalent age was correlated with cognitive performance in early childhood.

### Methods

Research Ethics Committee approval was granted for this study. We studied 50 children who were born preterm. The median gestational age (GA) at birth was 29<sup>+5</sup> (range 25<sup>+5</sup> – 34<sup>+4</sup>) weeks and median age at scan was 40<sup>+6</sup> (38 – 46) weeks. No infants had evidence of major focal lesions on MRI. The children were assessed using the Bayleys III scales of neurodevelopmental performance at 2 years corrected age.

MRI was performed on a Philips 3 Tesla MR system sited on the neonatal intensive care unit at Queen Charlotte's and Chelsea Hospital. 3D MPRAGE and T2 weighted imaging were acquired prior to DTI. DTI was acquired in 32 non-collinear directions with a *b* value of 750 s/mm<sup>2</sup>. Thalamo-cortical connectivity was assessed as described previously (1). Briefly, cortical masks for each infant were derived from their T2 weighted images and multiple cortical regions of interest (ROI)s (~500/ hemisphere) were generated using poisson disk sampling. Probabilistic tractography was performed between the thalamus and each cortical ROI. Individual maps were aligned to a common template, smoothed and merged into a 4D volume for statistical analysis. Linear regression analysis was performed to assess the relationship between thalamo-cortical connectivity at term and cognitive scores at 2 years, corrected for GA at birth, age at scan and parental socio-economic group.

### Results

Cognitive scores at 2 years of age were correlated to connectivity between thalamus and superior frontal, supplementary motor, superior parietal, right anterior temporal and right medial temporal lobes (Figure 1).

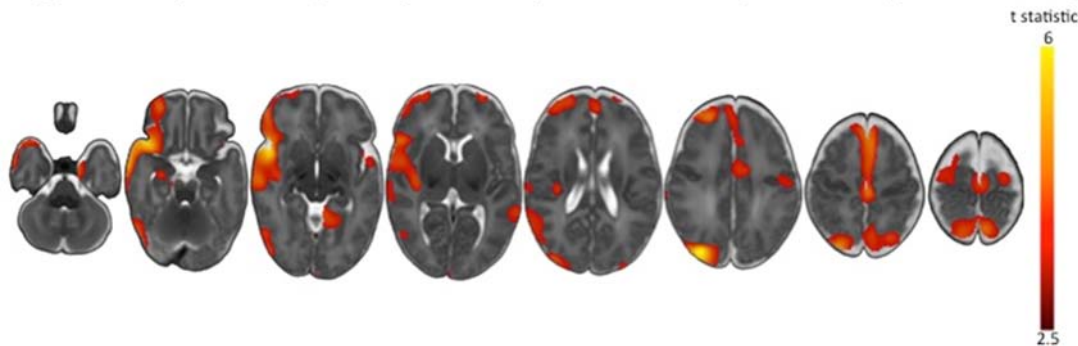


Figure 1. Regions where thalamo-cortical connectivity at term was correlated to cognition at 2 years of age, corrected for multiple comparisons at  $p < 0.05$  FDR corrected.

### Discussion

We have observed a relationship between cognitive performance in early childhood and connectivity at term equivalent age in neural systems that are responsible for executive performance, attention, and working memory.

### Conclusions

This study suggests that our approach to investigating thalamo-cortical connectivity may be an effective early imaging biomarker of subsequent neurodevelopmental performance in children who are born preterm.

### References

1. Ball et al. The influence of preterm birth on the developing thalamocortical connectome. *Cortex* Epub ahead of print.