and removal of placental suppressors when clamping the cord. The locus coeruleus is activated causing the arousal.

A spontaneous resting state activity has been found in newborn infants with fMRI.[2] This activity may correspond to the idea of William James that there is a ”stream of consciousness”. It involves five hubs including the somatosensory system and the auditory and visual cortex in the infants. This is in contrast to adults where ten hubs were defied including the insula, precuneus and ventromedial prefrontal cortex. Thus the infant is probably only aware of what it feels, sees and hears in present time, while the adult relates the sensory input to memories, itself and also plans for the future.

REFERENCES

1 http://www.nuffieldbioethics.org.
2 Fransson P, Skiold B, Horsch S, *et al*. Resting-state networks in the infant brain. *PNAS* 2007;104(39):15531–36

IS-020 FUNCTIONAL CONNECTIVITY IN THE INFANT BRAIN

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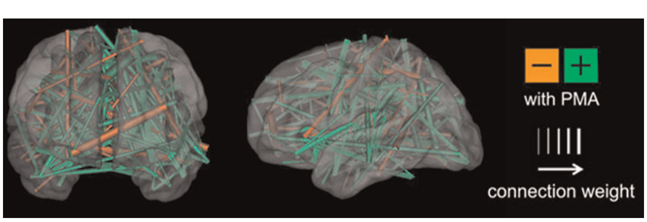
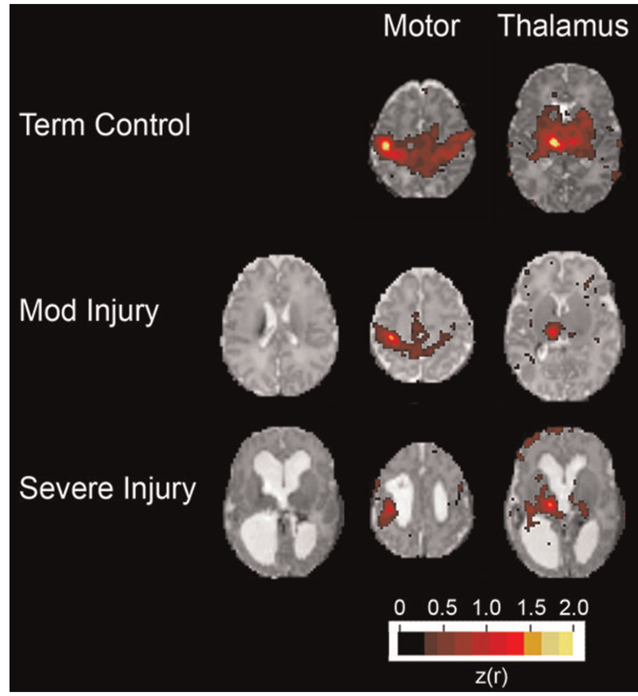
Advanced MRI techniques have been increasingly applied in infants to explore the structural and functional architecture of the developing brain. Functional connectivity magnetic resonance imaging (fcMRI) utilises spontaneous, low-frequency, coherent fluctuations in blood oxygen level dependent signal to identify networks of functional cerebral connections. Application of fcMRI in infants provides unique technical challenges. To obtain high-quality fcMRI data, investigators have applied new technology and modified acquisition practices. Advanced analysis techniques have also been developed to improve anatomic registration, eliminate artifactual variance and improve signal-to-noise ratios. These measures have enabled successful, robust fcMRI investigations in neonates. Importantly, these methods are transferrable across institutions and clinical populations of interest.

Neonatal fcMRI investigations have included healthy, term-born infants and prematurely-born infants with and without cerebral injury. In these populations, fcMRI data has been used to identify immature networks as early as 26 weeks postmenstrual age. These networks gradually mature. Prematurity (Figure 1) and white matter injury (Figure 2) significantly affect connectivity, altering network configuration and strength. These results demonstrate the promise of fcMRI as an investigational tool of neurodevelopment, providing insight into the earliest forms of functional cerebral development. While key groundwork has been laid, additional efforts are necessary to apply continued advances in technology and methodology. Expanded investigations will provide greater understanding of the processes underlying typical and atypical cerebral development and the role of these networks in neurodevelopmental outcomes.



Abstract IS-020 Figure 1 EEG recording of a preterm baby at 31 weeks of gestational age using clinically approved EEG cap. Support vector machine multivariate pattern analysis results illustrating connections important for differentiating healthy, term-born infants and very preterm infants scanned at term equivalent postmenstrual age. Caliber of connections weighted by difference magnitude. Vectors colored green are those stronger in term infants, while orange vectors are stronger in very preterm infants



Abstract IS-020 Figure 2 Individual fcMRI correlation maps illustrating Fisher z-transformed correlation coefficients (z(r); threshold = 0.3) overlaid on subject-specific, atlas-registered T2-weighted images. Results for very preterm infants scanned at term equivalent postmenstrual age with moderate and severe white matter injury included. Results for healthy, term-born subject provided for comparison. Maps were generated using an ROI located in the hemisphere of greater injury

IS-021 FUNCTIONAL MRI AND LANGUAGE DEVELOPMENT IN INFANTS AND CHILDREN

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Language is specific to the human and can, thus, not be studied in the animal. In the adult, there is a strong dominance of the left hemisphere for most aspects of language and stroke in language regions often leads to permanent aphasia. In contrast, lesions in similar locations acquired very early do not lead to an impaired language function in the affected child.

With the advent of fMRI, the cerebral representation of language organisation can now be studied non-invasively even in smaller children.

Questions

1. Language representation during development?
2. Early left hemispheric lesions and language representation?
3. If there is language reorganisation, does it affect right hemispheric functions?
4. How good is right hemispheric language?
5. What is the time frame for reorganisation?

Answers

1. Language representation is initially bilateral and increasingly left dominated during development.