Abstract

Objective: Resting state connectivity analysis has never been carried out on children with hypoxic-ischaemic encephalopathy (HIE) before. It is unknown whether the brain damage alters the functional integration and development of the brain resting state networks (RSNs). Therefore, this study aims to compare functional connectivity networks between 6-8 year olds cooled for moderate HIE at birth and age-matched controls. We hypothesise that children with HIE will show disrupted RSN connectivity, possibly accounting for some of their observed functional deficits.

Method: Resting-state fMRI from 13 children with HIE and 14 controls entered a group independent component analysis to identify RSNs. Group comparisons of the identified networks was carried out using dual regression with permutation testing.

Results: Three significant ($p \leq 0.05$) between-group differences were found. Firstly, reduced connectivity was observed within the frontal part of the default mode network (DMN), in children with HIE. Secondly, reduced connectivity within the left-lateralised fronto-parietal network (LFPN) was seen. Thirdly, there was an increased connectivity between the ventral attention network and the angular gyrus, within the DMN, in children with HIE.

Conclusions: When the attention network is engaged in children with HIE, there is an increased connectivity to the DMN, demonstrating their inability to suppress the DMN when focusing on a task. It represents a reduced anticorrelation between the DMN and attention networks in HIE, mimicking connectivity changes seen in ADHD. This may explain why attention deficits are observed in HIE. Furthermore, LFPN deficits in children with HIE may explain their language and memory difficulties.