Preterm birth leaves its mark in the functional networks of the brain

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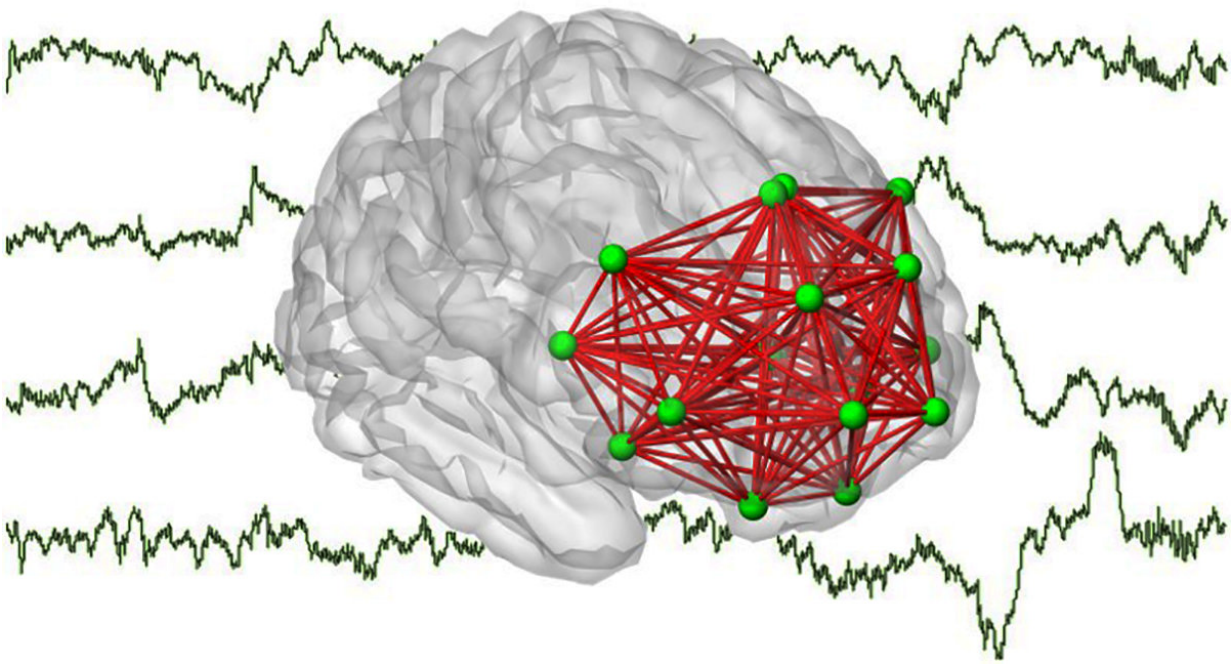

The figure depicts frontal networks of cortical interactions found in the present study. These networks were disclosed by computer analysis based on newborn brainwaves (electroencephalograph) shown in the background. Credit: Anton Tokariev

Researchers at the University of Helsinki and the Helsinki University Hospital have proven that premature birth has a significant and, at the same time, a very selective effect on the functional networks of a child's

brain. The effects can primarily be seen in the frontal lobe, which is significant for cognitive functions.

Premature birth is globally the most important risk factor for life-time disorders and defects in neurocognitive functions. However, current methods have not shed much light on how premature birth affects the early activity of neurons in the frontal lobe, significant specifically to cognitive functions.

A study involving 46 infants exposed to very early prematurity and nearly 70 healthy and mature control infants was recently conducted at the University of Helsinki and the Helsinki University Hospital. Brain function in the infants was monitored and measured with the help of an EEG cap, developed earlier at the clinic, revealing new information on the subject.

"In this study, a new 'source analysis' method was used for the first time to measure functional networks in the infant brain: with the help of a computer model, the measured EEG signals were interpreted as activity in the infant cortex, which enabled the evaluation of the functional networking of neurons in a very versatile manner on the cortical level", says Sampsa Vanhatalo, a professor in clinical neurophysiology and the head of the study.

It was found that there are several overlapping functional neural networks in the cortex of a newborn. Another finding was that premature birth has a significant, but also a very selective effect on these networks. The clearest effect can be seen in the functional networks of the frontal lobe, especially significant to cognitive functions.

"We were able to demonstrate how the strength of synapses in the frontal lobe is linked with the neurological abilities of infants. This provides an extremely interesting opportunity to use the functional networking of the

brain as an early indicator in, for example, clinical trials that compare the effects of different treatments on brain development. The selective changes found in the study also provide a potential explanation for attention deficit and other cognitive issues often found in children who are prematurely born."

Vanhatalo points out that functional MRI imaging does not show the functional coupling of an infant's neurons, even though the method is still widely used all over the world for studying this very phenomenon.

"Therefore, our EEG findings are the first results that actually provide information on cortical functional networks in preterm infants."

The study results have been published in the scientific journal Cerebral Cortex.

More information: Anton Tokariev et al. Preterm Birth Changes Networks of Newborn Cortical Activity, *Cerebral Cortex* (2018). DOI: 10.1093/cercor/bhy012

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