Teenagers' brains affected by preterm birth

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New research at the University of Adelaide has demonstrated that teenagers born prematurely may suffer brain development problems that directly affect their memory and learning abilities.

The research, conducted by Dr Julia Pitcher and Dr Michael Ridding from the University of Adelaide's Robinson Institute, shows reduced 'plasticity' in the brains of teenagers who were born preterm (at or before 37 weeks gestation).

The results of the research are published today in the *Journal of Neuroscience*.

"Plasticity in the brain is vital for learning and memory throughout life," Dr Pitcher says. "It enables the brain to reorganize itself, responding to changes in environment, behavior and stimuli by modifying the number and strength of connections between neurons and different brain areas. Plasticity is also important for recovery from brain damage.

"We know from past research that preterm-born children often experience motor, cognitive and learning difficulties. The growth of the brain is rapid between 20 and 37 weeks gestation, and being born even mildly preterm appears to subtly but significantly alter brain microstructure, neural connectivity and neurochemistry.

"However, the mechanisms that link this altered brain physiology with behavioral outcomes - such as memory and learning problems - have remained unknown," Dr Pitcher says.

The researchers compared preterm adolescents with those born at term, and also with term-born adults. They used a non-invasive magnetic brain stimulation technique, inducing responses from the brain to obtain a measure of its plasticity. Levels of cortisol, normally produced in response to stress, were also measured to better understand the chemical and hormonal differences between the groups.

"Teenagers born preterm clearly showed reduced neuroplasticity in response to brain stimulation," Dr Pitcher says. "Surprisingly, even very modest preterm birth was associated with a reduced brain response. On the other hand, term-born teenagers were highly 'plastic' compared with adults and the preterm teens.

"Preterm teens also had low levels of cortisol in their saliva, which was highly predictive of this reduced brain responsiveness. People often associate increased cortisol with stress, but cortisol fluctuates up and down normally over each 24-hour period and this plays a critical role in learning, the consolidation of new knowledge into memory and the later retrieval of those memories. This might be important for the development of a possible therapy to overcome the neuroplasticity problem," she says.

Provided by University of Adelaide