MedicalXpress

Better brain wiring linked to family genes

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(PhysOrg.com) -- How well our brain functions is largely based on our family's genetic makeup, according to a University of Melbourne led study.

The study published in the international publication *The* Journal of Neuroscience provides the first evidence of a genetic effect on how 'cost-efficient' our brain network wiring is, shedding light on some of the brain's make up.

Lead author Dr. Alex Fornito from the Melbourne Neuropsychiatry Centre at the University of Melbourne said the findings have important implications for understanding why some people are better able to perform certain tasks than others and the genetic basis of mental illnesses and some neurological diseases.

He said how the brain's network is organized has been a mystery to scientists for years. "The brain is an extraordinarily complex network of billions of nerve cells interconnected by trillions of fibres," he said.

"The brain tries to maximize its bang-for-buck by striking a balance between making more connections to promote efficient communication and minimising the "cost" or amount of wiring required to make these connections. Our findings indicate that this balance, called 'cost-efficiency', has a strong genetic basis."

"Ultimately, this research may help us uncover which specific genes are important in explaining differences in cognitive abilities, risk for mental

illness and neurological diseases such as schizophrenia and Alzheimer's disease, leading to new gene-based therapies for these disorders."

"Although genes play a major role in brain function, the environment and other factors contribute to when things go wrong in cases of mental illness and other brain disorders," he said.

The research team, which included scientists at the Universities of Queensland and Cambridge, UK compared the brain scans of 38 identical and 26 non-identical twins from the Australian Twin Registry.

Using new techniques, the researchers were able to construct detailed maps of each person's brain network and measured the cost-efficiency of network connections for the entire brain, as well as for specific brain regions.

"We found that people differed greatly in terms of how cost-efficient the functioning of their brain networks were, and that over half of these differences could be explained by genes," said Dr. Fornito.

Across the entire brain, more than half (60%) of the differences between people could be explained by genes. Some of the strongest effects were observed for regions of the prefrontal cortex which play a vital role in planning, strategic thinking, decision-making and memory.

Previous work has shown that people with more efficient brain connections score higher on tests of intelligence, and that brain network cost-efficiency is reduced in people with schizophrenia, particularly in the prefrontal cortex.

"This exciting discovery opens up a whole new area of research focus for scientists around the world," he said.

Provided by University of Melbourne