

Intelligence 'networks' discovered in brain for the first time

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Credit: Wikimedia Commons

Scientists from Imperial College London have identified for the first time two clusters of genes linked to human intelligence.

Called M1 and M3, these so-called gene networks appear to influence

cognitive function - which includes memory, attention, processing speed and reasoning.

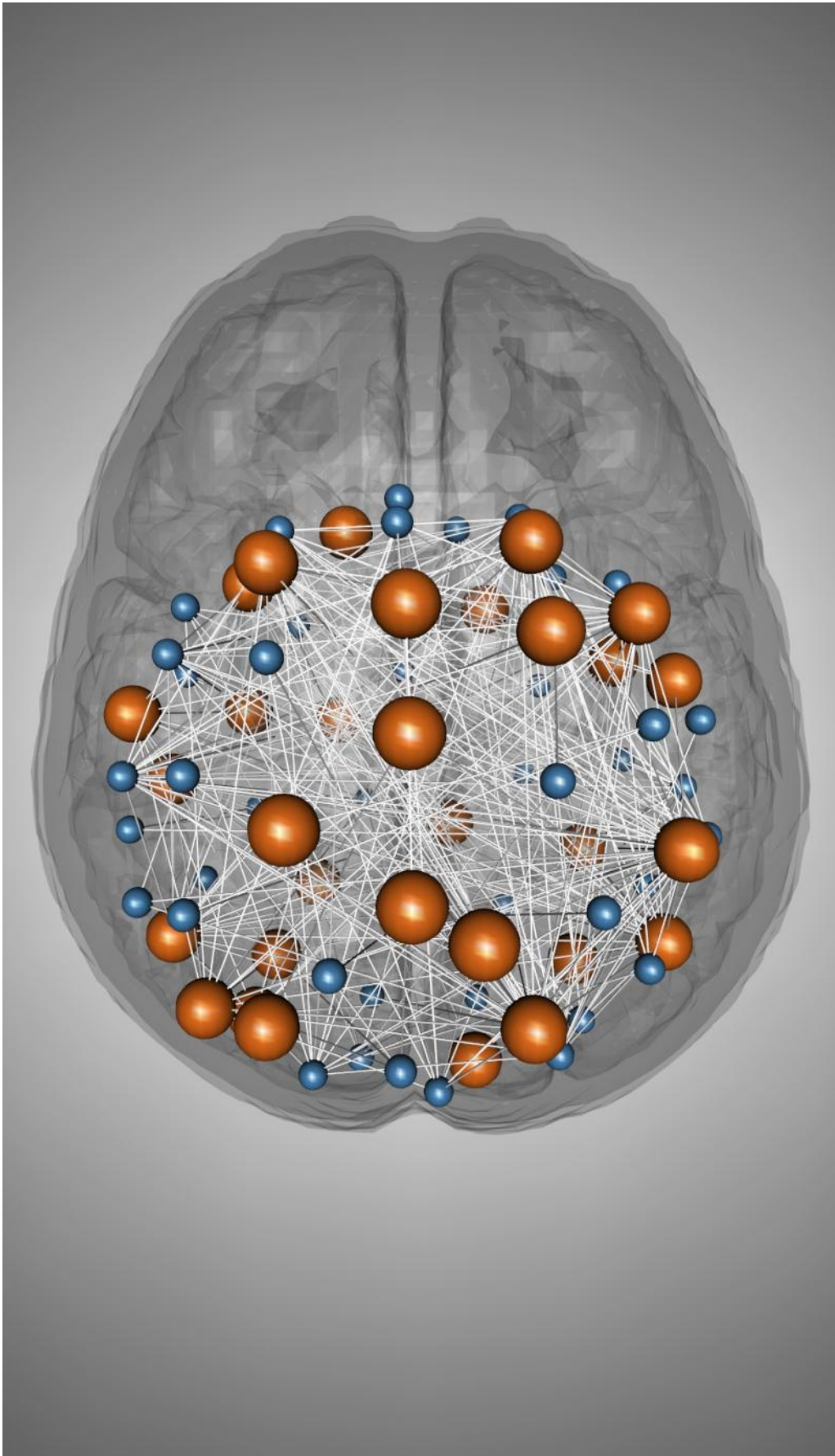
Crucially, the scientists have discovered that these two networks - which each contain hundreds of [genes](#) - are likely to be under the control of master regulator switches. The researchers are now keen to identify these switches and explore whether it might be feasible to manipulate them. The research is at a very early stage, but the scientists would ultimately like to investigate whether it is possible to use this knowledge of gene networks to boost cognitive function.

Dr Michael Johnson, lead author of the study from the Department of Medicine at Imperial College London, said: "We know that genetics plays a major role in intelligence but until now haven't known which genes are relevant. This research highlights some of genes involved in [human intelligence](#), and how they interact with each other.

What's exciting about this is that the genes we have found are likely to share a common regulation, which means that potentially we can manipulate a whole set of genes whose activity is linked to human intelligence. Our research suggests that it might be possible to work with these genes to modify intelligence, but that is only a theoretical possibility at the moment - we have just taken a first step along that road."

In the study, published in the journal *Nature Neuroscience*, the international team of researchers looked at samples of human brain from patients who had undergone neurosurgery for epilepsy. The investigators analysed thousands of genes expressed in the human brain, and then combined these results with genetic information from healthy people who had undergone IQ tests and from people with neurological disorders such as autism spectrum disorder and intellectual disability.

They conducted various computational analyses and comparisons in order to identify the [gene networks](#) influencing healthy human [cognitive abilities](#). Remarkably, they found that some of the same genes that influence human intelligence in healthy people were also the same genes that cause impaired cognitive ability and epilepsy when mutated.



Brain gene-network shows convergence between cognition and neurodevelopmental disorders. Credit: Duke-NUS Medical School

Dr Johnson added: "Traits such intelligence are governed by large groups of genes working together - like a football team made up of players in different positions. We used computer analysis to identify the genes in the human brain that work together to influence our cognitive ability to make new memories or sensible decisions when faced with lots of complex information. We found that some of these genes overlap with those that cause severe childhood onset epilepsy or intellectual disability.

"This study shows how we can use large genomic datasets to uncover new pathways for [human brain](#) function in both health and disease. Eventually, we hope that this sort of analysis will provide new insights into better treatments for neurodevelopmental diseases such as epilepsy, and ameliorate or treat the cognitive impairments associated with these devastating diseases."

More information: Systems genetics identifies a convergent gene network for cognition and neurodevelopmental disease, *Nature Neuroscience*, [DOI: 10.1038/nn.4205](https://doi.org/10.1038/nn.4205)

Provided by Imperial College London

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