Study links genes with function across the human brain

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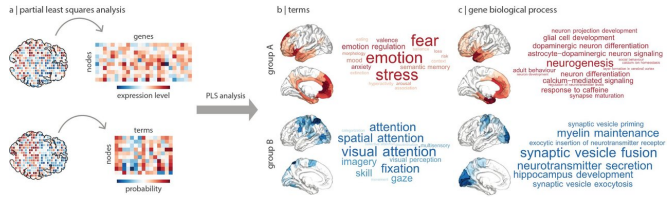

A new study provides a map linking the genetic signature of functions across the human brain. Credit: The Neuro

Many psychiatric disorders have genetic causes, but the exact mechanism of how genes influence higher brain function remains a mystery. A new study provides a map linking the genetic signature of functions across the human brain, a tool that may provide new targets for future treatments.

Led by Bratislav Misic, a researcher at The Neuro (Montreal Neurological Institute-Hospital) of McGill University, a group of scientists performed machine learning analysis of two Open Science datasets: the gene expression atlas from the Allen Human Brain Atlas and the functional association map from Neurosynth. This allowed them to find associations between gene expression patterns and functional brain tasks such as memory, attention, and mood.

Interestingly, the team found a clear genetic signal that separated cognitive processes, like attention, from more affective processes, like fear. This separation can be traced to gene expression in specific cell types and molecular pathways, offering key insights for future research into psychiatric disorders. Cognition, for example, was linked more to the gene signatures of inhibitory or excitatory neurons. Affective processes, however, were linked to support cells such as microglia and astrocytes, supporting a theory that inflammation of these cells is a risk factor in mental illness. The genetic signature related to affect was centred on a brain region called the anterior cingulate cortex, which has been shown to be vulnerable in mental illness.

Published in the journal *Nature Human Behaviour* on March 25, 2021, this study draws a direct link between gene expression and higher brain function, by mapping gene signatures to functional processes across the human brain.

"In this work we found molecular signatures of different psychological processes," says Misic. "This is exciting because it provides a first step to understand how human thoughts and emotions arise from specific genes, biological pathways and cell types."

More information: Mapping gene transcription and neurocognition across human neocortex, *Nature Human Behaviour* (2021). DOI: 10.1038/s41562-021-01082-z

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