



Investigating the Impact of Environmental Factors on Mental Health Using Omics

Unveiling the Link Between DNA Methylation and Mental Health

Xinyang, a third-year PhD student at King's College London, is exploring how DNA methylation impacts cortical structures. Her research delves into identifying specific DNA methylation markers that correlate with variations in cortical thickness and surface area. This investigation aims to determine whether these markers provide insights into psychiatric disorders or educational attainment.

What is DNA Methylation?

DNA methylation is a fundamental epigenetic process susceptible to environmental exposures such as smoking, diet, and social interactions. These factors can modulate gene expression and potentially predispose individuals to various diseases and psychiatric disorders. Previous research within Xinyang's team has shown significant associations between DNA methylation and genes related to learning and memory in subcortical brain regions like the hippocampus.

Understanding CpG Sites

What are CpG Sites?

CpG sites are regions of DNA where a cytosine nucleotide is followed by a guanine nucleotide. These sites are crucial for gene regulation. These sites are vulnerable to methylation.

Why are they important?

CpG sites are examined for their role in DNA methylation, which can influence gene expression and, consequently, brain structure and function.

Xinyang's Quest

Xinyang's research is focused on identifying DNA methylation markers linked to cortical thickness and surface area variations. These markers could potentially offer clues about psychiatric disorders and educational achievement.

Preliminary Results

Initial findings from Xinyang's research are promising:

- **Six significant CpG sites** are associated with average cortical thickness.
- **Three CpG sites** show significant associations with total cortical surface area.
- **Regional analyses** reveal three significant CpG sites, each providing unique insights into brain structure.





Genetic Insights into Environmental Influences

Xinyang's research provides valuable insights into how environmental factors may influence cortical structure and function:

- Genes associated with cortical thickness and surface area are downregulated in brain tissues, indicating their importance in neuronal development and function.
- Identified pathways include neuron projection guidance and immune regulation, highlighting their diverse biological functions.
- Associations with neurodegenerative disorders like Parkinson's and Alzheimer's disease suggest potential links between cortical morphology and neurological health.

Exploring Causal Links

The exploration of causal links between DNA methylation and psychiatric disorders and educational attainment reveals how environmental factors might expose individuals to mental health risks. Using Mendelian randomisation analyses, Xinyang has uncovered connections between specific DNA methylation markers and increased risks of psychiatric disorders such as anorexia nervosa, schizophrenia, major depressive disorder, and bipolar disorder, as well as educational attainment. These findings enhance our understanding of the genetic basis of mental health and suggest targeted interventions to mitigate risk factors and improve outcomes.

Join The Journey

The environMENTAL project continues to research how environmental factors impact mental well-being. Stay tuned for more updates on Xinyang's groundbreaking work investigating the association between environmental factors, DNA methylation, and mental health outcomes.

