Press Release

Media contact
Rhiannon Bugno
Biological Psychiatry: Cognitive Neuroscience and Neuroimaging
BPCNNI@sobp.org

Brain Connectivity Is Disrupted in Schizophrenia

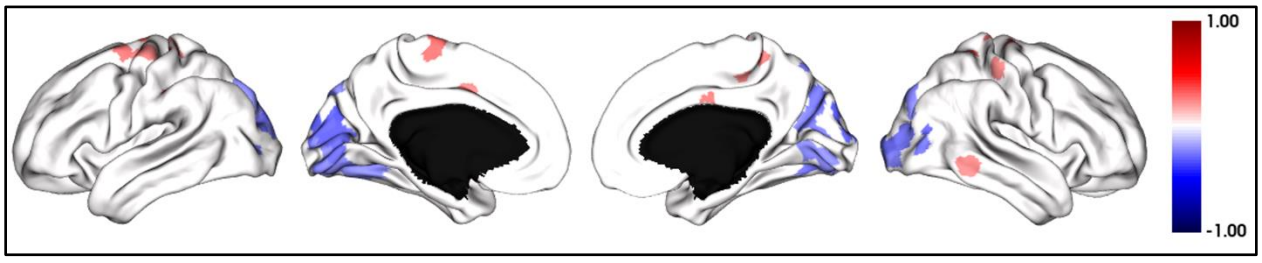
Disruptions develop with diagnosed disease according to a new study published in Biological Psychiatry: Cognitive Neuroscience and Neuroimaging

Philadelphia, October 17, 2023 – Schizophrenia, a neurodevelopmental disorder that features psychosis among its symptoms, is thought to arise from disorganization in brain connectivity and functional integration. Now, a new study in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, published by Elsevier, finds differences in functional brain connectivity in people with and without psychosis and schizophrenia that could help researchers understand the neural underpinnings of this disease.

The brain's cortex is organized in a hierarchical fashion, anchored by the sensorimotor cortex at one end and by multimodal association areas at the other, with the task of integrating incoming sensory information with internal and external sensory signals. The loss of executive control in schizophrenia may stem from disruption of this hierarchical signaling.

Alexander Holmes, a PhD candidate at Monash University who led the study, said, *"We used brain imaging and novel mathematical techniques to investigate the hierarchical organization of the brains of individuals with early psychosis and established schizophrenia. This organization is important for brain health, as it regulates how we can effectively respond to and process stimuli from the external world."*

The researchers used resting-state functional magnetic resonance imaging (fMRI) to measure gradients, an estimate of inter-regional functional coupling. Previous work had suggested that the primary sensory-fugal gradient was disrupted with schizophrenia, but the current study showed instead that secondary processing of the sensorimotor-visual gradient was affected in people with the disease.



Caption: Brain areas with the greatest difference between individuals with and without schizophrenia, with a pronounced negative effect in visual areas of the brain (Credit: *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*).

Holmes added, *"We found that the organizational pattern that differentiates visual and sensorimotor pathways is significantly impaired in individuals with schizophrenia but not in individuals with early psychosis. We then found that this impairment explains behavioral and clinical symptoms of*

schizophrenia. Our results highlight that changes in brain organization provide valuable insights into the mechanisms of schizophrenia, helping us better understand the disease and how it progresses."

Cameron Carter, MD, Editor of *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, said of the work, *"These new approaches to test mathematical models of the organization of circuits in the human brain are beginning to reveal the nature of the disruption of neural integration that underlies psychotic symptoms in people with schizophrenia. Targeting these changes offers a new approach to how we think about developing treatments for this often difficult to treat illness."*

Notes for editors

The article is "Disruptions of Hierarchical Cortical Organization in Early Psychosis and Schizophrenia," by Alexander Holmes, Priscila Levi, Yu-Chi Chen, Sidhant Chopra, Kevin Aquino, James Pang, and Alex Fornito (https://doi.org/10.1016/j.bpsc.2023.08.008). It appears as an Article in Press in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, published by Elsevier.

The article is openly available at https://www.biologicalpsychiatrycnni.org/article/S2451-9022(23)00220-3/fulltext.

Copies of this paper also are available to credentialed journalists upon request; please contact Rhiannon Bugno at BPCNNI@sobp.org. Journalists wishing to interview the authors may contact Alexander Holmes at alexander.holmes1@monash.edu.

The authors' affiliations and disclosures of financial and conflicts of interests are available in the article.

Cameron S. Carter, MD, is Professor of Psychiatry and Psychology and Director of the Center for Neuroscience at the University of California, Davis. His disclosures of financial and conflicts of interests are available here.

About *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*

Biological Psychiatry: Cognitive Neuroscience and Neuroimaging is an official journal of the Society of Biological Psychiatry, whose purpose is to promote excellence in scientific research and education in fields that investigate the nature, causes, mechanisms and treatments of disorders of thought, emotion, or behavior. In accord with this mission, this peer-reviewed, rapid-publication, international journal focuses on studies using the tools and constructs of cognitive neuroscience, including the full range of non-invasive neuroimaging and human extra- and intracranial physiological recording methodologies. It publishes both basic and clinical studies, including those that incorporate genetic data, pharmacological challenges, and computational modeling approaches. The 2022 Journal Impact Factor™ score from Clarivate for *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* is 5.9.
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Media contact
Rhiannon Bugno, Editorial Office
Biological Psychiatry: Cognitive Neuroscience and Neuroimaging
BPCNNI@sobp.org