Press Release

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Researchers Identify Altered Functional Brain Connectivity in Autism Subtypes

Using brain imaging and machine learning differences between groups and individuals provide new clues to subtypes, according to a new study in Biological Psychiatry

Philadelphia, December 5, 2023 – What happens in the brain to cause many neurodevelopmental disorders, including autism spectrum disorder (ASD), remains a mystery. A major limitation for researchers is the lack of biomarkers, or objective biological outputs, for these disorders, and in the case of ASD, for specific subtypes of disease. Now, a new study uses brain imaging and machine learning to identify altered functional brain connectivity (FC) in people with ASD – importantly, taking into consideration differences between individuals. The study appears in *Biological Psychiatry*, published by Elsevier.

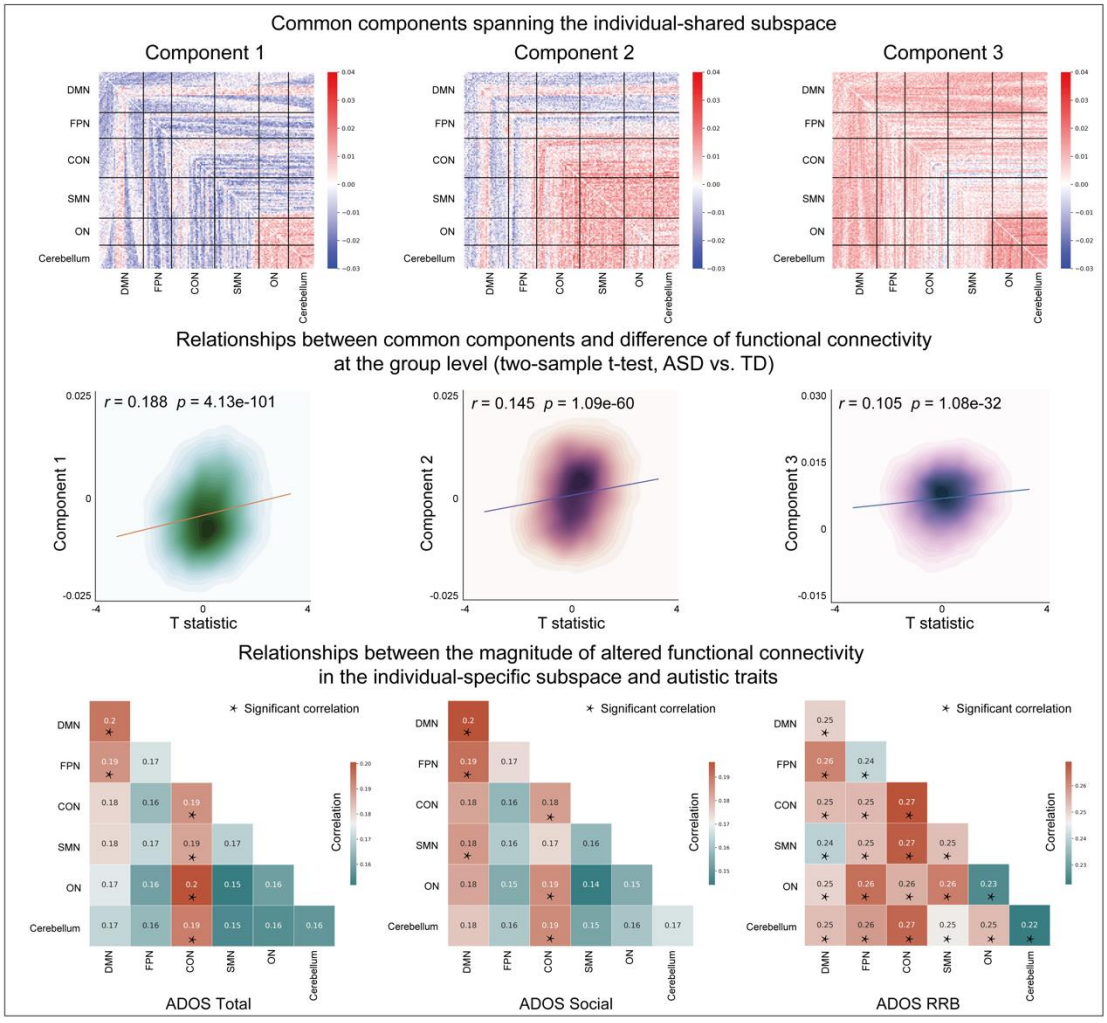
John Krystal, MD, Editor of *Biological Psychiatry*, said of the work, *"ASD has long been known to be a highly heterogeneous condition. While genetic studies have provided some clues to different causes of the disorder in different groups of ASD patients, it has been challenging to separate subtypes of ASD using other types of biomarkers, such as brain imaging."*

Brain imaging scans are also extremely heterogenous, varying greatly from one individual to another, making such data difficult to use as a biomarker. Previous studies have identified both increased and decreased FC in people with ASD compared to healthy controls, but because those studies focused on groups of participants, they failed to appreciate heterogeneous autism-related atypical FC. In the new study, the researchers showed that although heterogenous brain imaging subtypes could be distinguished among participants with ASD.

Xujun Duan, PhD, senior author of the work at the University of Electronic Science and Technology of China, explained, *"In this study, we used a technique to project altered FC of autism onto two subspaces: an individual-shared subspace, which represents altered connectivity pattern shared across autism, and an individual-specific subspace, which represents the remaining individual characteristics after eliminating the individual-shared altered connectivity patterns."*

The investigators found that the individual-shared subspace altered FC of autism reflects differences at the group level, while individual-specific subspace altered FC represents individual variation in autistic traits. These findings suggest a requirement to move beyond group effects and to capture and capitalize on the individual-specific brain features for dissecting clinical heterogeneity.

Dr. Krystal added, *"Part of the challenge to finding subtypes of ASD has been the enormous complexity of neuroimaging data. This study uses a sophisticated computational approach to identify aspects of brain circuit alterations that are common to ASD and others that are associated with particular ASD traits. This type of strategy may help to more effectively guide the development of personalized treatments for ASD, i.e., treatments that meet the specific needs of particular patients."*



Caption. Individual-shared subspaces were associated with functional connectivity differences between people with autism spectrum disorder (ASD) and typically developing controls at the group level, while individual-specific subspace was associated with individual variation in autistic traits (Credit: *Biological Psychiatry*).

Notes for editors

The article is "Disentangling the Individual-Shared and Individual-Specific Subspace of Altered Brain Functional Connectivity in Autism Spectrum Disorder," by Xiaolong Shan, Lucina Q. Uddin, Rui Ma, Pengfei Xu, Jinming Xiao, Lei Li, Xinyue Huang, Yu Feng, Changchun He, Huafu Chen, and Xujun Duan (https://doi.org/10.1016/j.biopsych.2023.09.012). It appears as an Article in Press in *Biological Psychiatry*, published by Elsevier.

Copies of this paper are available to credentialed journalists upon request; please contact Rhiannon Bugno at Biol.Psych@sobp.org. Journalists wishing to interview the authors may contact Xujun Duan, PhD, at duanxujun@uestc.edu.cn.

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

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The journal publishes novel results of original research which represent an important new lead or significant impact on the field, particularly those addressing genetic and environmental risk factors, neural circuitry and neurochemistry, and important new therapeutic approaches. Reviews and commentaries that focus on topics of current research and interest are also encouraged.

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