Investigating Anatomical Connectivity in Individuals With Autism Spectrum Disorder Using Magnetic Resonance Imaging

Stoica, Caterina (School: The Masters School)

Autism spectrum disorder (ASD) is characterized by difficulties in processing sensorimotor information and general cortical excitability. Symptoms are likely attributable to impairments in connectivity between the thalamus, a deep gray-matter structure responsible for relaying sensorimotor information, and various cortical regions. While previous research has shown differences in functional connectivity, or neural signaling, in individuals with ASD, there is a lack of research on anatomical connectivity and the structure of neural tracts. This study analyzed diffusion-weighted data derived from magnetic resonance imaging (mean diffusivity, fractional anisotropy, and mode of anisotropy metrics) from 17 typically-developing adults matched to 16 participants with ASD. The study found that, for the right thalamus, the value for fractional anisotropy was significantly less in the ASD group and the mean diffusivity values were greater in the ASD group than the control group ($p<0.05$), indicating a loss of directionality of diffusion in degenerated white matter tissue. Results from the left thalamus did not show statistically significant differences. As this is the first study to discover differences in anatomical connectivity associated with ASD, future research is needed to further investigate specific structural abnormalities using tractography. The newfound anatomical data will improve understanding of the disorder and how abnormalities correlate with sensorimotor symptoms. These findings also provide the opportunity to define ASD by its structural implications, facilitating the development of better diagnostic methods and treatments for autistic individuals and improving their livelihood.

Awards Won: