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BIPOLAR DISORDERS Factsheet

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What is diffusion tensor imaging (DTI)?

DTI is a specialised imaging technique that uses MRI technology to investigate the movement of water within tissues of interest. It is a powerful imaging method for characterising the integrity of white matter circuitry because it links anatomical and functional neuroimaging.

By applying a magnetic field, the movement (“diffusivity”) of water molecules can be visualised in vivo. The diffusion of water is influenced by the cellular structure of the surrounding tissues, and measures such as fractional anisotropy (FA) were derived as an approximate measurement for the freedom of movement. In areas of high structural coherence such as white matter, FA is highest, indicating that water is moving in relatively fixed directions. It is lower in grey matter, and close to zero in cerebrospinal fluid, indicating that water is moving freely. Consequently, changes in FA values are interpreted to be representing alterations in the structural integrity of the regional white matter.

Region-of-interest studies assess white matter integrity in individual brain regions, while voxel-based analyses assess whole brain white matter integrity. Tract-based spatial statistics isolates the central core of white matter tracts with the highest FA and reports significant clusters within that white matter skeleton. Three classes of white matter tracts have been identified. Commissural tracts connect the two hemispheres of the brain, association tracts connect regions within the same hemisphere, and projection tracts connect each region to other parts of the brain or spinal cord.

Understanding neurological structural alterations using DTI in people with bipolar disorder may provide insight into the molecular neurobiology of aberrant neurotransmission, by highlighting brain regions where reduced cellular integrity may contribute to symptom expression.

What is the evidence for DTI findings in people with bipolar disorder?

Moderate quality evidence suggests decreases in white matter integrity in people with bipolar disorder in the left cingulum fibers extending to genu of corpus callosum (forceps minor)/anterior thalamic radiation/inferior fronto-occipital fasciculus/uncinate fasciculus, right anterior superior longitudinal fasciculus, and right anterior thalamic projections.

There were similar decreases in people with bipolar disorder and people with schizophrenia in white matter integrity in the genu of the corpus callosum extending to anterior thalamic radiation/cingulum fibers/inferior fronto-occipital fasciculus, and in left posterior cingulum fibers.

For more information see the technical table



NeuRA (Neuroscience Research Australia) is one of the largest independent medical and clinical research institutes in Australia and an international leader in neurological research.

Diseases of the brain and nervous system pose the greatest health, economic and social burden of any disease group because they are chronic, debilitating and have no known cures.

Medical research is the cornerstone of efforts to advance the health and wellbeing of families and the community. Our dedicated scientists are focussed on transforming their research into significant and practical benefits for all patients.

While we hope you find this information useful, it is always important to discuss any questions about bipolar disorder or its treatment with your doctor or other health care provider.

HOW YOUR SUPPORT HELPS

We are able to make significant advances due to the generosity of countless people. Your donation allows us to continue to work towards transforming lives. For information on how you can support our research, phone **1300 888 019** or make a secure donation at neura.edu.au.

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