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Compensatory neural connections stave off bipolar disorder onset

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By Lucy Piper, Senior medwireNews Reporter

Patients at high genetic risk of bipolar disorder may be able to avert onset of the condition due to natural adaptive neuroplasticity that allows the brain to compensate for underlying network dysfunction associated with the condition, researchers report.

They found that 41 euthymic patients with bipolar disorder and 25 of their unaffected siblings shared similarly increased frontolimbic connectivity during facial affect processing, compared with 46 unrelated mentally healthy individuals, but the siblings also showed evidence of adaptive hyperconnectivity within the ventral visual stream.

"The ability of the siblings to rewire their brain networks means they have adaptive neuroplasticity that may help them avoid the disease even though they still carry the genetic scar of bipolar disorder when they process emotional information", lead author of the study Sophia Frangou (Icahn School of Medicine at Mount Sinai, New York, USA) said in a press release.

Functional magnetic resonance imaging showed that during facial affect recognition both bipolar disorder patients and their unaffected siblings had increased connectivity between the amygdala and ventral prefrontal cortex compared with controls.

"This finding therefore represents a connectomic marker of shared genetic vulnerability to the disorder", the researchers explain in *Translational Psychiatry*. "However, it is not sufficient for disease expression as it was present in relatives who had remained free of any clinical psychopathology."

The resilience of these relatives appeared to arise from adaptive neural responses, which were displayed as increased connectivity from the fusiform gyrus and inferior occipital gyrus to the ventral prefrontal cortex.

The team notes that in bipolar disorder patients engagement of the fusiform gyrus is reduced very early on in the disease and volume loss increases with disease progression.

"It would therefore appear that resilient relatives have adapted their neural responses to emotional faces via additional recruitment throughout the affect-processing network, which is suggestive of increased plasticity between lower and higher visual areas that may increase functional network efficiency", they write.

By contrast, during working memory tasks, resilient relatives and controls engaged the same increased connection from the right inferior occipital gyrus to the right dorsolateral prefrontal cortex, whereas bipolar disorder patients showed widespread hypoconnectivity within the entire working memory network.

The lack of diffuse hypoconnectivity in the resilient siblings but its presence in patients suggests this is a connectomic marker for disease expression, the researchers explain.

Frangou concluded: "Looking for biological mechanisms that can protect against illness opens up a completely new direction for developing new treatments. Our research should give people hope that even though mental illness runs in families, it is possible to beat the odds at the genetic lottery."