Even after treatment, brains of anorexia nervosa patients not fully recovered

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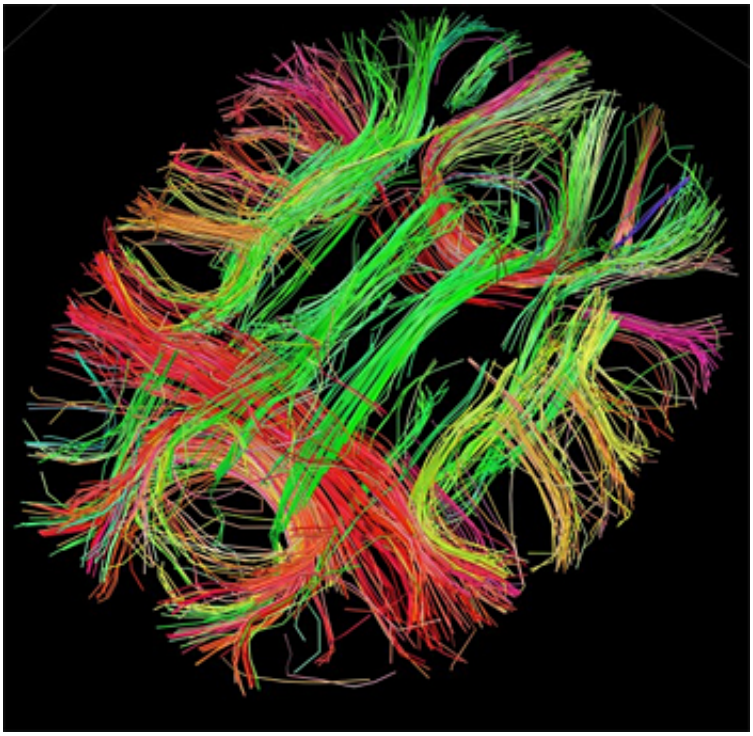

White matter fiber architecture of the brain. Credit: Human Connectome Project.

Even after weeks of treatment and considerable weight gain, the brains of adolescent patients with anorexia nervosa remain altered, putting them at risk for possible relapse, according to researchers at the University of Colorado Anschutz Medical Campus.

The study, published last week in the *American Journal of Psychiatry*, examined 21 female adolescents before and after treatment for anorexia and found that their brains still had an elevated reward system compared to 21 participants without the eating disorder.

"That means they are not cured," said Guido Frank, MD, senior author of the study and associate professor of psychiatry and neuroscience at the University of Colorado School of Medicine. "This disease fundamentally changes the brain response to stimuli in our environment. The brain has to normalize and that takes time."

Brain scans of anorexia nervosa patients have implicated central reward circuits that govern appetite and food intake in the disease. This study showed that the reward system was elevated when the patients were underweight and remained so once weight was restored.

The neurotransmitter dopamine might be the key, researchers said.

Dopamine mediates reward learning and is suspected of playing a major role in the pathology of anorexia nervosa. Animal studies have shown that food restriction or weight loss enhances dopamine response to rewards.

With that in mind, Frank, an expert in eating disorders, and his colleagues wanted to see if this heightened brain activity would normalize once the patient regained weight. Study participants, adolescent girls who were between 15 and 16 years old, underwent a series of reward-learning taste tests while their brains were being scanned.

The results showed that reward responses were higher in adolescents with anorexia nervosa than in those without it. This normalized somewhat after weight gain but still remained elevated.

At the same time, the study showed that those with anorexia had widespread changes to parts of the brain like the insula, which processes taste along with a number of other functions including body self-awareness.

The more severely altered the brain, the harder it was to treat the illness, or in other words, the more severely altered the brain, the more difficult it was for the patients to gain weight in treatment.

"Generalized sensitization of brain reward responsiveness may last long into recovery," the study said. "Whether individuals with anorexia nervosa have a genetic predisposition for such sensitization requires further study."

Frank said more studies are also needed to determine if the continued elevated brain response is due to a heightened dopamine reaction to starvation and whether it signals a severe form of anorexia among adolescents that is more resistant to treatment.

In either case, Frank said the biological markers discovered here could be used to help determine the likelihood of treatment success. They could also point the way toward using drugs that target the dopamine reward system.

"Anorexia nervosa is hard to treat. It is the third most common chronic illness among teenage girls with a mortality rate 12 times higher than the death rate for all causes of death for females 15-24 years old," Frank said. "But with studies like this we are learning more and more about what is actually happening in the brain. And if we understand the system, we can develop better strategies to treat the disease."

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