MedicalXpress

With a little training, signs of schizophrenia are averted

August 22 2012

Animals that literally have holes in their brains can go on to behave as normal adults if they've had the benefit of a little cognitive training in adolescence. That's according to new work in the August 23 *Neuron*, a Cell Press publication, featuring an animal model of schizophrenia, where rats with particular neonatal brain injuries develop schizophrenia-like symptoms.

"The brain can be loaded with all sorts of problems," said André Fenton of New York University. "What this work shows is that experience can overcome those disabilities."

Fenton's team made the discovery completely by accident. His team was interested in what Fenton considers a core problem in schizophrenia: the inability to sift through confusing or conflicting information and focus on what's relevant.

"As you walk through the world, you might be focused on a phone conversation, but there are also kids in the park and cars and other distractions," he explained. "These information streams are all competing for our brain to process them. That's a really challenging situation for someone with schizophrenia."

Fenton and his colleagues developed a laboratory test of cognitive control needed for that kind of focus. In the test, rats had to learn to avoid a foot shock while they were presented with conflicting information. Normal rats can manage that task quickly. Rats with brain

lesions can also manage this task, but only up until they become young adults—the equivalent of an 18- or 20-year-old person—when signs of schizophrenia typically set in.

While that was good to see, Fenton says, it wasn't really all that surprising. But then some unexpected circumstances in the lab led them to test animals with adolescent experience in the cognitive control test again, once they had grown into adults.

These rats should have shown cognitive control deficits, similar to those that had not received prior cognitive training, or so the researchers thought. Instead, they were just fine. Their schizophrenic symptoms had somehow been averted.

Fenton believes their early training for focus forged some critical neural connections, allowing the animals to compensate for the injury still present in their brains in adulthood. Not only were the animals' behaviors normalized with training, but the patterns of activity in their brains were also.

The finding is consistent with the notion that mental disorders are the consequence of problems in brain development that might have gotten started years before. They raise the optimistic hope that the right kinds of experiences at the right time could change the future by enabling people to better manage their diseases and better function in society. Adolescence, when the brain undergoes significant change and maturation, might be a prime time for such training.

"You may have a damaged brain, but the consequences of that damage might be overcome without changing the damage itself," Fenton says. "You could target schizophrenia, but other disorders aren't very different," take autism or depression, for example.

And really, in this world of infinite distraction, couldn't we all use a little more cognitive control?

More information: Lee et al.: "Early cognitive experience prevents adult deficits in a neurodevelopmental schizophrenia model. DOI:10.1016/j.neuron.2012.06.016

Provided by Cell Press

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