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How Repeated Stress Impairs Memory

ScienceDaily (Mar. 7, 2012) — Anyone who has ever been subject to chronic stress knows that it can take a toll on emotions and the ability to think clearly. Now, new research uncovers a neural mechanism that directly links repeated stress with impaired memory. The study, published by Cell Press in the March 8 issue of the journal *Neuron*, also provides critical insight into why stress responses can act as a trigger for many mental illnesses.

Stress hormones are known to influence the prefrontal cortex (PFC), a brain region that controls high level "executive" functions such as working memory and decision making. "Previous work has shown that chronic stress impairs PFC-mediated behaviors, like mental flexibility and attention. However, little is known about the physiological consequences and molecular targets of long-term stress in PFC, especially during the adolescent period when the brain is more sensitive to stressors," explains the author this study, Dr. Zhen Yan, from the State University of New York at Buffalo. "

Dr. Yan and colleagues examined whether repeated stress had a negative influence on glutamate receptors in juvenile rats. Glutamate signaling plays a critical role in PFC function. They found that in response to repeated stress, there was a significant loss of glutamate receptors, which resulted in a deficit of PFC-mediated cognitive processes. The researchers went on to identify the molecular mechanisms that linked stress with the decrease in glutamate receptors and demonstrated that if they blocked these mechanisms, the stress-induced decrease in both glutamate receptors and recognition memory could be prevented.

Taken together, the findings identify a loss of glutamate receptors as an important target of repeated stress and link chronic stress with abnormal PFC function. "Since PFC dysfunction has been implicated in various stress-related mental disorders, delineating molecular mechanisms by which stress affects the PFC should be critical for understanding the role of stress in influencing the disease process," concludes Dr. Yan.

Reference:

1. Eunice Y. Yuen, Jing Wei, Wenhua Liu, Ping Zhong, Xiangning Li, Zhen Yan. **Repeated Stress Causes Cognitive Impairment by Suppressing Glutamate Receptor Expression and Function in Prefrontal Cortex.** *Neuron*, 2012 DOI: [10.1016/j.neuron.2011.12.033](https://doi.org/10.1016/j.neuron.2011.12.033)