

Stress hormone linked to short-term memory loss as we age

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A new study at the University of Iowa reports a potential link between stress hormones and short-term memory loss in older adults.

The study, published in the *Journal of Neuroscience*, reveals that having high levels of cortisol—a natural hormone in our body whose levels surge when we are stressed—can lead to memory lapses as we age.

Short-term increases in cortisol are critical for survival. They promote coping and help us respond to life's challenges by making us more alert and able to think on our feet. But abnormally high or prolonged spikes in cortisol—like what happens when we are dealing with long-term stress—can lead to negative consequences that numerous bodies of research have shown to include digestion problems, anxiety, weight gain and high blood pressure.

In this study, the UI researchers linked elevated amounts of cortisol to the gradual loss of synapses in the prefrontal cortex, the region of the brain that houses short-term memory. Synapses are the connections that help us process, store and recall information. And when we get older, repeated and long-term exposure to cortisol can cause them to shrink and disappear.

"Stress hormones are one mechanism that we believe leads to weathering of the brain," Jason Radley, assistant professor in psychology at the UI and corresponding author on the paper. Like a rock on the shoreline, after years and years it will eventually break down and disappear.

While previous studies have shown cortisol to produce similar effects in other regions of the aging brain, this was the first study to examine its impact on the pre-frontal cortex.

And although preliminary, the findings raise the possibility that short-memory decline in aging adults may be slowed or prevented by treatments that decrease levels of cortisol in susceptible individuals, says Radley. That could mean treating people who have naturally high levels of cortisol—such as those who are depressed—or those who experience repeated, long-term stress due to traumatic life events like the death of a loved one.

According to Radley and Rachel Anderson, the paper's lead author and a second year-graduate student in psychology at the UI, short-term memory lapses related to cortisol start around age 65. That's about the equivalent of 21 month-old rats, which the pair studied to make their discovery.

The UI scientists compared the elderly rats to four-month old rats, which are roughly the same age as a 20 year-old person. The young and elderly groups were then separated further according to whether the rats had naturally high or naturally low levels of corticosterone—the hormone comparable to cortisol in humans.

The researchers subsequently placed the rats in a T-shaped maze that required them to use their short-term memory. In order to receive a treat, they needed to recall which direction they had turned at the top of the T just 30, 60 or 120 seconds ago and then turn the opposite way each time they ran the maze.

Though memory declined across all groups as the time rats waited before running the maze again increased, older rats with high corticosterone levels consistently performed the worst. They chose the correct direction

only 58 percent of the time, compared to their older peers with low corticosterone levels who chose it 80 percent of the time.

When researchers took tissue samples from the rats' prefrontal cortexes and examined them under a microscope, they found the poor performers had smaller and 20 percent fewer synapses than all other groups, indicating memory loss.

In contrast, older rats with low corticosterone levels showed little memory loss and ran the maze nearly as well as the younger rats, who were not affected by any level of corticosterone – low or high.

Still, researchers say it's important to remember that stress hormones are only one of a host of factors when it comes to mental decline and memory loss as we age.

Provided by University of Iowa

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