

## Stress and the Influence on Alzheimer's Disease

UCI Mind Online

By: Cordula Dick-Muehlke, Ph.D.

It's become almost impossible to escape stress in our 21st century American life. Ongoing economic insecurity, a constant sense of time urgency fueled by instantaneous communication, and the multiple competing demands of family and work life, including caregiving, leave Americans with little opportunity to take a breather. In a nationwide survey of 1,226 Americans released by the American Psychological Association in January 2012, 44 percent reported experiencing increased stress over the past five years, and 22 percent recounted suffering extreme stress in 2011.

**While our bodies are equipped to manage real or perceived threat and then return to a normal state, the constant stress associated with meeting the demands of modern life can impair this ability, damaging both our bodies and our brains.**



When a stressful event occurs, our autonomic nervous system automatically initiates a **“fight or flight” response** during which the adrenal glands produce a rush of **adrenaline** and, if the crisis is severe or prolonged, **cortisol**, a long-acting stress hormone. A series of physiological changes (e.g., increase in blood pressure, heart rate, and breathing) prepare the body for an assault. Initially, the surge in stress hormones also sharpens memory and senses, leading to a hyper-alert state. Once the crisis is over, our parasympathetic nervous system induces a relaxation response in which the body's systems gradually resume normal functioning – a process that can take hours, days, and sometimes weeks. **Called allostasis, the entire stress-relaxation cycle ensures harmonious functioning of the mind and body during and after a crisis.**

**While some stress can “keep you on your toes,” too much can damage your cardiovascular system, gastrointestinal tract, brain, and more.** When stress is repetitive or unremitting, the body’s systems suffer wear and tear from repeated allostasis and the process can go haywire. Inefficiency in the stress response (e.g., inability to turn the response on or off) caused by metabolic wear and tear is known as **“allostatic loading.”** Over time, allostatic loading can have profoundly negative effects on the body, leading to conditions such as metabolic syndrome, hypertension, and ulcers as well as speeding up cellular aging.

Stress is equally deleterious for the brain. **Multiple studies suggest that too much stress, sometimes referred to as distress, increases risk for cognitive decline and Alzheimer’s disease.** While small doses of cortisol over short periods can boost learning and memory, excessive or prolonged elevations can do just the opposite. Whether caused by an external stressor or internal tension, **chronic stress harms the brain in multiple ways.**

**First, it impairs communication among brain cells or neurons.** Dendrites – branch-like extensions from neurons that receive impulses from neighboring cells – shrivel in the presence of excessive cortisol. As well, neurotransmitters, chemicals responsible for transmitting messages from one brain cell to another, malfunction.

**Secondly, chronic stress may slow the production of new neurons to replace injured or dying cells (i.e., neurogenesis) in the hippocampus, resulting in atrophy of this critical structure for learning and memory.** As demonstrated by Dr. Sonia Lupien at McGill University in Montreal, older adults with continuously high levels of cortisol perform worse on memory tests than those with low to moderate levels of the stress hormone and, on average, have a 14% smaller hippocampus. As the hippocampus degenerates, it becomes unable to fulfill its function of signaling the adrenal gland to stop secreting cortisol when a crisis is over. A downward spiral ensues as cortisol levels continue to climb, intensifying damage to the hippocampus, and further weakening its ability to shut down cortisol production.

**Thirdly, in a study conducted at UCI MIND, Dr. Kim Green and his colleagues found that stress hormones accelerated the development of Alzheimer’s in mice that had been genetically engineered to develop disease as they age. After just seven days of injecting young mice that were not yet old enough to show Alzheimer’s pathology, the researchers discovered elevated levels of the two abnormal proteins that underlie the disease.** Both the amyloid  $\beta$ -peptide that clumps into senile plaques and the abnormal form of tau which twists into neurofibrillary tangles were elevated. While previous researchers had shown a connection between stress and risk for cognitive decline, Dr. Green and his colleagues helped to elucidate the “why” behind the connections.

**Stress, unlike other risk factors for Alzheimer's disease (e.g., age), is modifiable. Much of the damage that stress can cause to the body and the brain can be avoided or even reversed by learning to better manage stress and engaging in stress-reducing activities.**

### **Protect Your Brain from Stress**

- Learn a relaxation response technique such as meditation or progressive muscle relaxation.
- Build optimism by practicing cognitive skills to counteract automatic negative thoughts that lead to stress and depression.
- As much as possible, take charge of your life and enjoy it. Feeling that you can influence your daily life can reduce stress.
- Exercise to reduce stress and promote growth of new neurons in the brain.
- Eat and sleep well. A nourishing low-fat diet and at least seven hours of sleep a night can help replenish your physical, mental, and emotional resources.
- Build your social support network. Lack of social support increases vulnerability to the damaging effects of stress.
- Give to others. Altruistic, unselfish behavior can help you develop a more positive attitude toward life.

See more at: <http://www.alz.uci.edu/alzheimers-disease/articles-of-interest/stress-and-the-influence-on-alzheimers-disease/#sthash.dK17zDkY.dpuf>

*Lorie Eber is a trained Wellness Coach, NASM Certified Personal Trainer, Gerontologist and author. Lorie Eber Wellness Coaching provides one-on-one guidance and support to clients who are ready to make permanent lifestyle changes and lead a happier, healthier life.*