Free chronic stress and the brain: response 2 case study sample

Education, University

Chronic Stress and the Brain: Response

Stress can occur in varying levels of severity and lengths of time and result in physiological responses that proportionate to the level and duration (Greenberg, Carr & Summers 2002). The functioning of the amygdala, hippocampus and prefrontal cortex are negatively affected by chronic stress in humans. The amygdala is the control center in the brain for emotions, emotional behavior and motivation (Wright). The hippocampus works closely with the amygdala; its primary functions are long term memories and declarative memory (Wright). The prefrontal cortex is responsible for goal oriented behaviors and executive functions such as short term memory, motor functions and sustained attention (Wright). The hippocampus sends signals directly to the amygdala (Wright).

In her article on stress and the brain, Greenberg (2012) describes the effects of glucocorticoids, specifically cortisol on the brain in stressful situations. When the amygdala receives the input that there is danger, it sends a signal to the hypothalamic-pituitary-adrenal axis (HPA axis) to release cortisol and other hormones to prepare the body for a fight or flight situation. The high level of cortisol is meant to be short term in the body but under long term stress, the levels stay elevated. This may cause the prefrontal cortex and hippocampus to actually shrink in size resulting in a decrease of creative thinking, difficulty with short term memory, problem solving and emotional processing (Greenberg 2012).

Stress hormones cause the neurons of the hippocampus to shrink. There are receptors in the neurons of the hippocampus for adrenal steroids. The increase size of the neurons in the amygdala results in greater fear and

aggression (The Rockefeller University). When there are increases in these hormones the neurons in the hippocampus shrink in response. The shrinkage of these neurons results in memory problems associated with the hippocampus (The Rockefeller University).

However, the release of stress hormones cause the neurons of the amygdala to grow (The Rockefeller University). This response in the amygdala is the opposite of the hippocampus. This response results in greater fear and aggression (The Rockefeller University).

Neurogenesis is the process of regeneration of neurons in the brain, particularly in the hippocampus (Gage 2002). For many years, scientists did not think that neurons had the ability to replicate but current research has shown this thought to be erroneous (Gage 2002). Neurons can generate during the developmental years from stem cells and recent research has shown that neurons in adults can also be produced in this manner (Gage 2002).

Cortisol and norepinephrine responses to stress physically change the brain (Bremmer 2006). The symptoms associated with PTSD such as intrusive flashbacks, hyperarousal, sleeplessness, difficulty concentrating and memory problems are directly attributable to the release of cortisol and other stress related hormones (Bremmer 2006). The symptoms of PTSD result in a cycle of perpetual fear (Bremmer 2006). Being in a constant state of fear causes the depression in people who suffer from PTSD (Bremmer 2006).

There are several strategies suggested by Greenberg (2012) in her article. DHA (Docosahexaenoic acid) is an Omega-3 fatty acid which is the primary building block of brain tissue which helps counteract the negative effects of

cortisol on the brain and reduces plaque buildup (Greenberg 2012). Exercise is also beneficial. Exercise has been shown to increase brain-derived neurotropic factor (BDNF) which promotes neurogenesis (Greenberg 2012). Activities such as yoga, meditation and prayer lowers anxiety. Relaxation helps the body to alter how genes react to free radicals and inflammation which has also been linked to PTSD. (Greenberg 2012). Experts recommend that these relaxation techniques reach their fullest potential when practiced long term (Greenberg 2012).

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