

Neurobiology: The Science of PTSD



Post-traumatic Stress Disorder (PTSD): Following exposure to a traumatic event such as a sexual assault, an individual may develop PTSD. PTSD is characterized by intrusive symptoms, including unwanted thoughts or images of the traumatic event, nightmares, and flashbacks; avoidant behaviors, such as avoiding places, events, or activities that trigger memories of the traumatic event; hyperarousal, such as hypervigilance, exaggerated startle response and always feeling “on edge;” and negative changes in beliefs, such as self-blame, negative expectations about the world, such as “the world is a dangerous place,” and inability to recall portions of the traumatic event.

- 31% of female rape victims develop PTSD sometime in their lives and 11% have chronic PTSD.

Kilpatrick, D. G., “Mental Health Impact of Rape,” National Women’s Study, National Violence Against Women Prevention Research Center, 2000.

- The amygdala is the brain region responsible for emotional processing, integrating emotion and memory, and initiating the autonomic response associated with fear. Many individuals with PTSD have hyperactive amygdalae, which leads to hypervigilance, increased avoidance, increased startle response, and increased overall anxiety.

*Shin, L. M., Rauch, S. L., Pitman, R. K., “Amygdala, medial prefrontal cortex, and hippocampal functions in PTSD.” *Psychobiology of Posttraumatic Stress Disorder: A Decade of Progress*, 1071, 67-79. 2006.*

- The hippocampus is the brain region responsible for processing sensory information into memories. The hippocampus also plays a role in mediating and “turning-off” the body’s stress response. Many studies have shown that individuals with PTSD tend to have smaller hippocampal volumes than individuals without PTSD. This may account for many of the memory disruptions associated with PTSD, such as intrusive memories of the trauma, difficulty recalling particular details of the trauma, and having memories of the trauma triggered by a current experience. Additionally, due to its smaller size, the hippocampus may have a harder time turning off the stress response, leading to an increase in overall anxiety.

*Bremner, J. D., “Traumatic stress: Effects on the brain.” *Dialogues in Clinical Neuroscience*, 8(4), 445-461. 2006.*

- The prefrontal cortex is the brain region responsible for executive functioning, working memory, and impulse control. The prefrontal cortex tends to be smaller in individuals with PTSD, which may result in impaired decision making, as well as both poor fear extinction (“unlearning” fear associated with PTSD triggers) and poor retention of fear extinction.

*Koenigs, M., Grafman, J., “Post-traumatic stress disorder: The role of medial prefrontal cortex and amygdala.” *Neuroscientist*, 15, 540-548. 2009.*