Neurobiology: During Trauma

KEY TERMS:
Amygdala: Brain region responsible for emotional processing, integrating memory and emotion, and the autonomic responses associated with fear.

Hippocampus: Brain region responsible for processing sensory information into memories. This region is very sensitive to hormone fluctuations.

Hypothalamic-Pituitary-Adrenal (HPA) Axis: Controls the body’s stress response. Releases hormones and chemicals, including cortisol, to respond to external stress. The HPA axis also rebalances the body after experiencing stress.

Hypothalamus: Brain region that regulates hormones, initiates the stress response of the HPA axis, and maintains homeostasis.

- During a sexual assault, the amygdala first detects a threat from the external environment. Then the amygdala activates the hypothalamus, the first structure of the HPA axis, which in turn floods the body with hormones and chemicals designed to enhance survival.


- The hormones and chemicals released by the HPA axis can impair rational thought, cause a flat affect, reduce energy available, increase hyperactivity, cause a complete shut-down of the body, and critically, they impair memory processing and consolidation. Since the hippocampus is very sensitive to hormone fluctuations, the flood of hormones accounts for traumatic memories frequently being fragmented, incomplete, or out of sequence. However, this impairment does not mean that a sexual assault cannot be accurately remembered and recounted.


- Alcohol can disrupt the encoding or organizing process of memory. Encoding the context of a sexual assault is impaired, so details such as time, place, and sequence of events may be further fragmented or not encoded at all. However, the hippocampus can often still encode sensory details (smells, sounds, etc.).


- The HPA axis remains overactive for 96 hours post-assault, meaning that symptoms of increased irritability, impaired concentration, mood swings, flat affect, etc. may persist for several days. Sleep plays a role in reregulating the HPA axis and restoring hormone levels to homeostasis. Additionally, sleep is vital in the processing and consolidation of memories, so traumatic memories may be clearer after several nights of sleep.


- The fight-or-flight response is a well-known response to a threat, but many survivors report a different response: freeze. This is called tonic immobility and is caused by the influx of hormones. Someone experiencing tonic immobility has complete muscle paralysis and is therefore unable to move. An estimated 12-50% of sexual assault survivors report tonic immobility during their assaults.
