Chapter highlights – Stress (Ch 7)

The purpose of “chapter highlights” is to offer a framework in which to think about the specific information discussed in each Brain Facts chapter. These highlights draw upon information in the chapter and on the new Brain Facts web site (http://www.brainfacts.org) and occasionally, on our own knowledge of neuroscience that may not be discussed in Brain Facts. Questions for Brain Bee will come from Brain Facts (new 2012 publication) and entries from the new Brain Facts web site that have “brainfacts.org” in the URL. Some but not all relevant entries are cited below.

Not all stress is bad http://www.brainfacts.org/across-the-lifespan/stress-and-anxiety/

- The brain is wired to detect and protect against threats
- Stress activates the sympathetic nervous system to ward off danger (real or perceived)
  - Acute stress is advantageous and promotes survival
    - Activates “fight or flight” mechanisms that, e.g., mobilizes energy stores and increases blood supply for delivery of oxygen and energy to muscles
    - Promotes immune function
    - Sensory systems are sharpened
    - Memory is improved
  - However, chronic or sustained state of stress compromises health http://www.brainfacts.org/across-the-lifespan/stress-and-anxiety/articles/2012/chronic-stress/
    - Memory is impaired
      - Prolonged exposure to glucocorticoids leads to loss of neuronal function in the hippocampus
    - Without a physical outlet (like running), energy is stored as fat
    - Immune function is suppressed
Stress activates three major communication systems in the body

- Voluntary nervous system (motor and sensory systems)

- Autonomic nervous system (sympathetic)
  - Part of the peripheral nervous that controls the activity of peripheral glands (adrenal glands, gonads, thyroid gland, etc) and organs (intestines, heart, etc)
  - The sympathetic and parasympathetic act in a “yin and yang” fashion (e.g., sympathetic acting to mobilize energy stores whereas parasympathetic promotes digestion and energy storage)
  - Exposure to perceived threat activates the sympathetic NS while dampening activity in the parasympathetic NS

- Endocrine system (release of adrenaline and glucocorticoid hormones)
  - The brain controls activity of the adrenal gland via hypothalamic and pituitary hormones
  - Information about some threatening event or object get to the brain (starts there or travels there via the sensory system) and is sent to the hypothalamus which sends a hormonal signal to the pituitary which in turn releases another hormone into the blood supply to affect the adrenal gland

Perception of being in control and personality traits are potent regulators of an individual’s physiological responses to a potentially stressful experience.

- The same experience can be viewed as either stressful or not by different individuals
  - A sense of control reduces physiological stress responses and avoids deleterious effects of chronic exposure to exogenous stressors
  - Perceived lack of control over a prolonged period of time correlates with increased risk for heart disease
  - Understanding what makes one individual more prone to stress and fear will help with future treatments of anxiety disorders, such as obsessive-compulsive disorder (OCD), phobias, and PTSD