Fear, Anxiety & the Brain (Physiology) [1]

Anonymous [2]19K reads

The brain structures and neurological mechanisms behind anxiety and fear are well-known by science. To understand and cope with these emotions in your life, you must first learn the basic physiological patterns that they follow.

With the theory [3], history [4], and a new view on the effectiveness of anxiety and fear [5] now in mind, it's time to map out exactly how these emotions manifest inside the brain. There are many brain structures, chemicals, and processes at work in the brain during a fear- or anxiety-arousing situation.

Luckily, the process always unfolds in the same fashion. Once you become familiar with the neurophysiology of fear and anxiety, you'll gain the psychological resiliency to realize that your own patterns of coping with these emotions are never up in the air. They have a firm biological set of instructions to follow; know the pattern, and you will know that your own patterns of interpretation are what count.

Emotion & Perception

We'll begin with the perception of fear. Sometimes it may appear that a feeling of fear or anxiety comes out of the blue, that these emotions simply show up unannounced whenever they feel like it. It's important to understand that *emotions always follow perception* [6]. You cannot feel an emotion without there first being some initial sensory input to prompt it.

Your five main senses—sight, hearing, taste, touch, and smell—absorb sensory information from your environment, turn those chemical and nerve signals into electric signals, which then activate and store inside different areas of the brain. If these signals are routinely interpreted in a fearful or anxious light, the mere twinge of the sensation or of a half-remembered memory can be enough to trigger these feelings again, even in the absence of direct sensory stimuli.

Consistent fear and anxiety are the product of unconscious stimuli/thought connections which themselves have origins in initial sensory perception and interpretation. Much of the work of coping with or "unlearning" your fears and anxieties involves making new associations between sensation, perception, and cognition in a conscious way. We'll dive deeper into this during a later lesson [7].

Brain Structures

Your senses are sending signals of anxiety and fear to your brain—where exactly do these signals go? And what do they do?

Here is a brief overview of the major brain structures [8] responsible for creating and making sense of anxiety and fear:

- **Adrenal Gland** – Part of you endocrine system. It produces many kinds of hormones that activate and regulate anxious, fearful, and stress responses. As the name suggests, it is the brain's adrenaline factory.
- **Amygdala** – The brain's emotional organizational center. The amygdala separates your emotional responses into threatening or non-threatening camps and is the storehouse of fearful memories and associations.
- **Hippocampus** – A primary brain structure for memory. The hippocampus both files away and recalls conscious memories and is one of the first-responders to give context and meaning to sensations and stimuli.
- **Hypothalamus** – This tiny structure is the seed of your "fight, flight, or freeze" response.
- **Pituitary Gland** – Another endocrine structure. Together with the hypothalamus and adrenal gland, it forms a feedback system that controls stress reactions [9], mood, and emotion.
- **Sensory Cortex** – The brain structure responsible for collecting uncontextualized sensory information.
- **Thalamus** – A junction box for sensory information. The thalamus reroutes specific sensory information to other parts of the brain.
- **ACTH, Cortisol, Oxytocin, Epinephrine (Adrenaline), and Norepinephrine** – A sampling of the over 30 hormones and chemicals released during "flight, fight, or freeze" responses. They are released by both your adrenal (bloodstream) and autonomic nervous systems. Learn more specifics here [10] and watch a video of the process here [11] .

The Autonomic Nervous System

These brain structures work in concert to interpret, contextualize, and store your sensory reactions and emotional experiences, fear and anxiety included. They themselves are part of a larger system called the autonomic nervous system [12], itself divided into the sympathetic and parasympathetic systems. The **sympathetic nervous system** is the "arousal" side of your nervous system. It regulates how your brain and body gears up to face stress and emergencies, and ultimately causes the classic bodily symptoms of these emotions: increased heart rate and blood pressure, widened eyes, and the shutting down of non-critical emergency mode systems, such as digestion.

The **parasympathetic nervous system** essentially acts to reverse the effects of the

sympathetic nervous system—heart rate decreases, blood pressure levels off, and normal function returns to all parts of the body. This system relaxes and soothes you.

Furthermore, remember that your *fear responses are completely automatic and unconscious*. Any fear-eliciting situation always takes two simultaneous "paths" in the brain. The "low road" (thalamus, amygdala, hypothalamus) sends an immediate uncontexutalized call to act on the stimulus. The "high road" (thalamus, sensory cortex, hippocampus, amygdala, hypothalamus) takes into account conscious interpretation—"Is this really something I need to be scared of?" The trick is, your "low road" response always happens first—the body protects itself full-stop and only later asks questions. Knowing this two-tiered system exists is itself a great confidence booster--you are neither "weak" nor "childish" for reacting in accordancd with fear's "low road" response.

How Anxiety and Fear Differ in the Brain

Anxiety and fear have quite a bit of overlap in terms of brain structures and chemical signaling in the brain. Remember, however, that **fear is a response to immediate, present danger; anxiety is a response to unclear or imagined potentialities**. Some researchers feel that anxiety is a more "elaborate" form of fear. Others feel the difference is purely psychological [13] . Regardless, both responses make use of the brain's intricate emotional systems and prepare the body and mind for potential threats of many different kinds.

Links
[1] https://staging.explorable.com/en/e/fear-anxiety-the-brain-physiology
[2] https://staging.explorable.com/en/users/grharriman
[3] https://explorable.com/theories-of-emotion
[4] https://explorable.com/the-history-of-anxiety-fear
[5] https://explorable.com/are-anxiety-fear-bad-things
[6] http://www.medscape.com/viewarticle/747429
[7] https://explorable.com/cognitive-behavioral-therapy-cbt
[8] http://science.howstuffworks.com/life/inside-the-mind/emotions/fear.htm
[9] https://en.wikipedia.org/wiki/Hypothalamic%E2%80%93pituitary%E2%80%93adrenal_axis
[10] http://science.howstuffworks.com/life/inside-the-mind/emotions/fear2.htm
[11] https://www.youtube.com/watch?v=gmwiJ6ghLIM
[12] http://www.everydayhealth.com/sexual-health/dr-laura-berman-autonomic-nervous-system.aspx
[13] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3181681/