Stress Questions

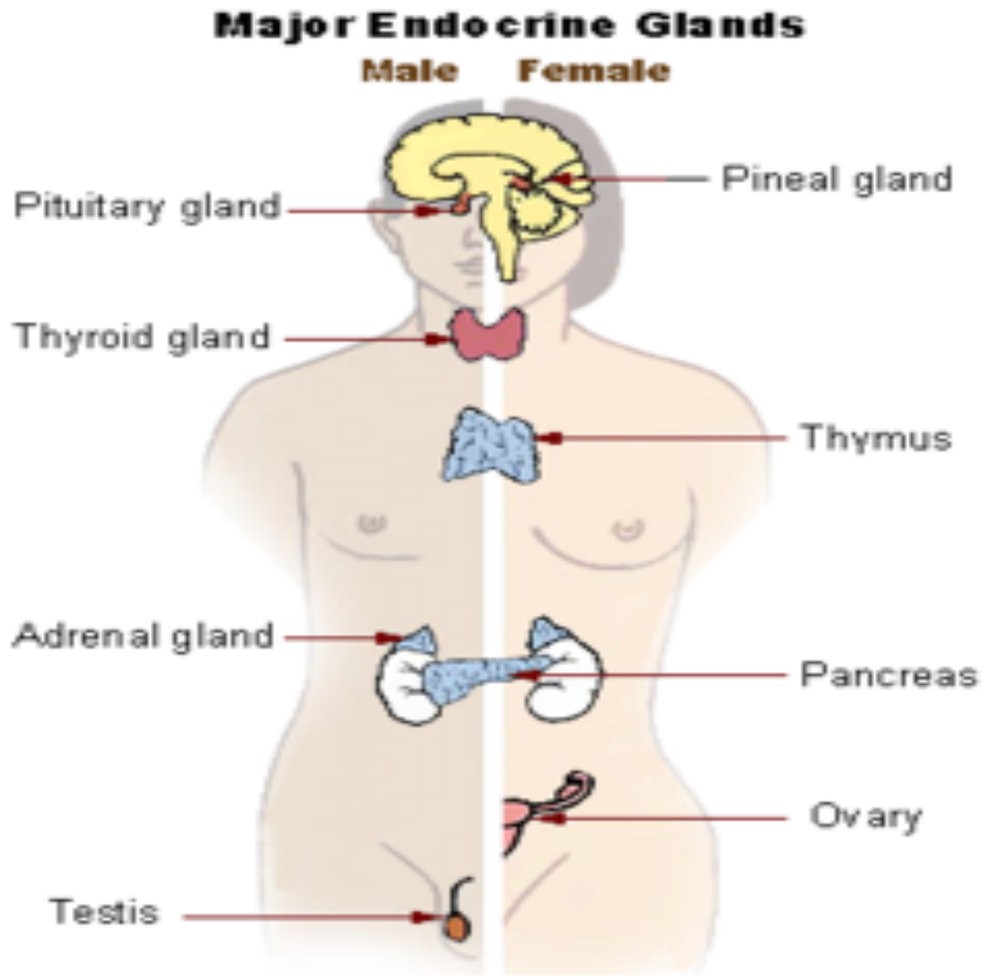
- To what extent is stress helpful or harmful in your life?
- What is it like when you are under stress? Is there a difference between short-term and long-term stress?
- How do you deal with stress?

Learning Outcome:

- B7- Using one or more examples, explain functions of two hormones in human behavior.

Hormones

- Chemical substances, secreted by organs called glands, that affect the functioning of other organs.



Hormone #1: **Cortisol**

- **Stress hormone**
  - Produced in adrenal gland
  - Designed to return the body to homeostasis following a stressful event
  - Some cortisol is good
  - Chronic stress = continual release of cortisol = bad

Stress: Fight or Flight

1. Oh geez…**ZOMBIE**!!!!!
2. Eyes and ears send information to the **A(HHH!!)mygdala**.
3. If danger, **Amygdala** sends a message to the **Hypothalamus**.
4. **Hypothalamus** sends signal to the **Adrenal Gland** to release **epinephrine**.
5. **Epinephrine** increases heart rate & lung capacity. Ready for action.
4. If danger continues, the body releases **cortisol**. This allows the body to regain energy lost from the adrenaline burst and return to homeostasis.

Types of Stress

Good Stress: EUSTRESS

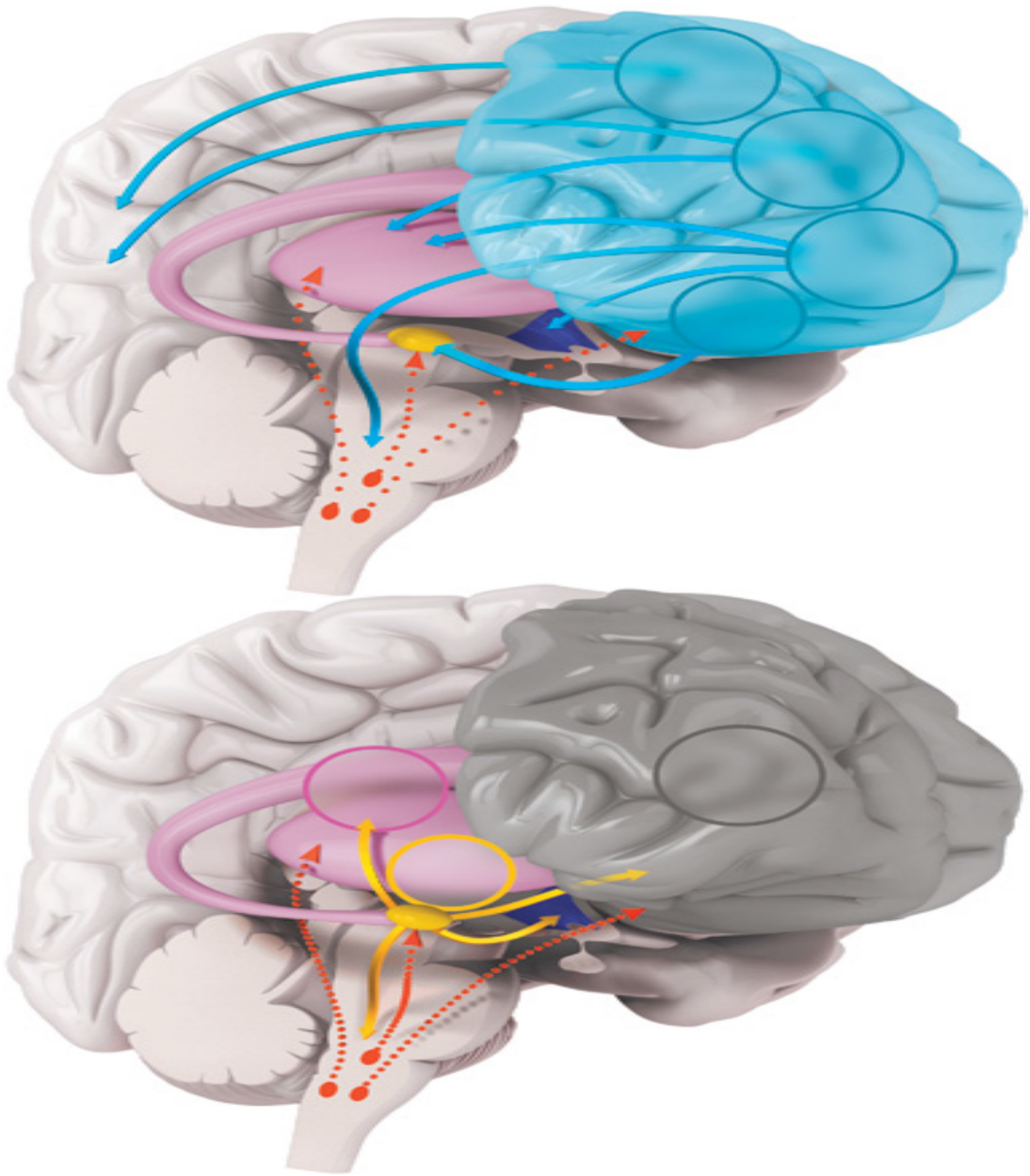
- Stress that gives you motivation to accomplish needed tasks.

Bad Stress: DISTRESS

- Stress that leads to toxic results such as anxiety.

How Stress Impacts Your Brain

- How Stress Impacts Your Brain



Studies for Learning Outcome B7 (Cortisol):

- B7- Using one or more examples, explain functions of two hormones in human behavior.

Newcomer et al (1999)

- **Learning Outcomes: B7 & B9**
- **Hormone:** Cortisol
- **Aim:** To determine the effect of cortisol on memory
- **Method:** Double-blind study that asked three groups to take varying levels of cortisol over a four- day period and tested their ability to remember verbal information

1. **<u>High Level</u>:** Tablet of 160 mg Cortisol each day … simulates a major stressful event.

2. **<u>Low Level</u>:** Tablet of 40 mg of Cortisol each day … Simulated a mildly stressful event.

3. **<u>Placebo</u>:** Tablet with no active ingredient.

Newcomer et al. (1999)

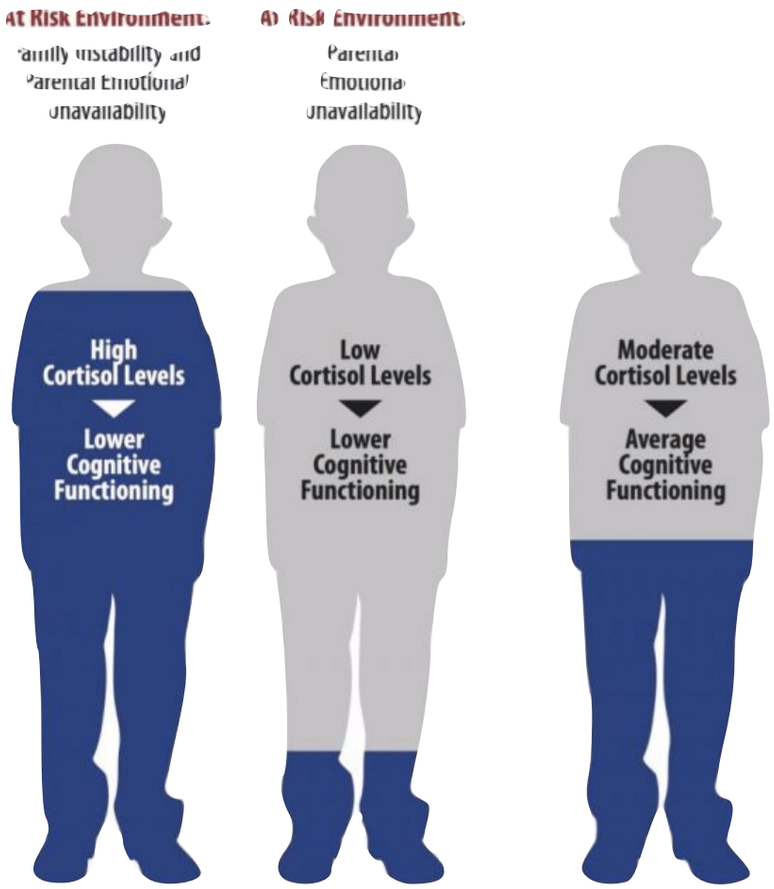
- **Findings:**
  - The High Level group performed *worse* on the memory test than the Low Level group
  - The Low Level group showed no memory decrease when compared with the placebo group
- **Conclusions:** High levels of cortisol have a negative impact on a person's ability to recall verbal data

Suor et al. (2015)

- **Learning Outcomes: B7, B8, B9 (on extra handout)**
- **Aim:** To investigate how levels of cortisol impact the cognitive development of children
- **Method:**
  - Performed a longitudinal study on 201 low-income children in the United States
  - Measured the cortisol levels in children at ages of 2, 3, & 4
  - Watched children interact with parents and measure family stability and trauma at age 2
  - Measured cognitive ability (language, motor functioning & problem solving) at age 4

Suor et al. (2015)

- **Findings:**
  - Exposure to violence and elevated levels of stress were associated with higher and lower levels of cortisol
  - 30% High, 40% Low, 30% Moderate (trauma tends to lead to high C; chronic stress tends to lead to low C)
  - Children with both high and low cortisol levels had reduced cognitive functioning
  - Children with moderate cortisol levels had average cognitive functioning



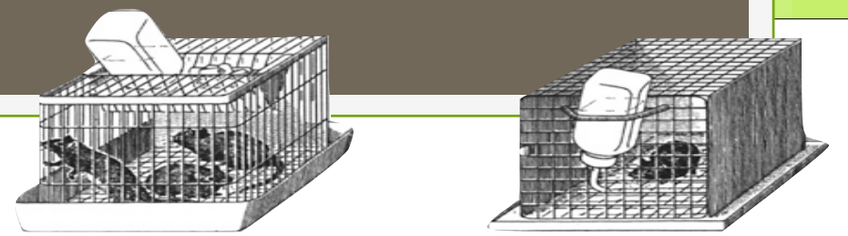
Suor et al (2015)

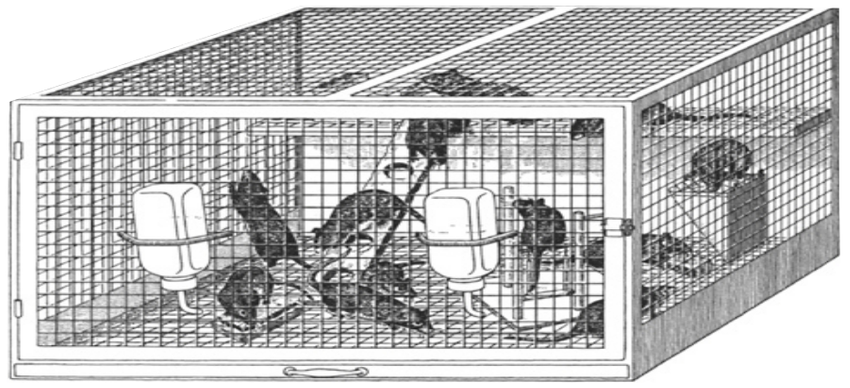
- **Conclusions**
  - Children with high and low cortisol levels had delayed cognitive functioning.
- **Explanation**
  - <u>High Levels of Cortisol:</u> Associated with decreased strength in areas of the brain such as frontal lobe and hippocampus.
  - <u>Low Levels of Cortisol:</u> Ongoing stress leads to a state of ***hypocortisol (depletion of cortisol)***. Children lacked motivation to engage in tasks.
- **Critical Thinking?**

Learning Outcome:

- B8: Discuss two effects of the environment on physiological (biological) processes.

Rosenzweig (1972)





- **Aim:** To determine how the environment can impact the neurological development of rats.
- **Method**: Randomly assigned lab rats to one of three conditions.
  - **Control**: Typical laboratory cage (other rats, adequate room and food/water)
  - **Impoverished**: Small cage, isolated, adequate food/water
  - **Enriched**: Large space, multiple toys, companions, adequate food/water

After living 4-10 weeks, rats were killed and autopsies performed on their brains (randomly assigned numbers to eliminate researcher bias).

Rosenzweig (1972)

- **Findings:** The enriched rats had…
  1. Thicker and heavier cerebral cortexes
  2. Larger neurons
- **Conclusions:** An *enriched environment* produced more developed and bigger brains. A *stressed environment* produced less developed brains.
- **Critical Thinking?**

McEwen et al. (2006)

- **Learning Outcome: B8: Environment & Physiology**
- **Aim:** To determine the impact of chronic stress on neural structure
- **Method:**
  - Control Group: Rats in normal sized cages with two other rats
  - Treatment Group: Rats placed in highly stressful restraints for 6 hours each day (for 21 day period)
  - On the 22nd day, all rats were euthanized and their brains dissected

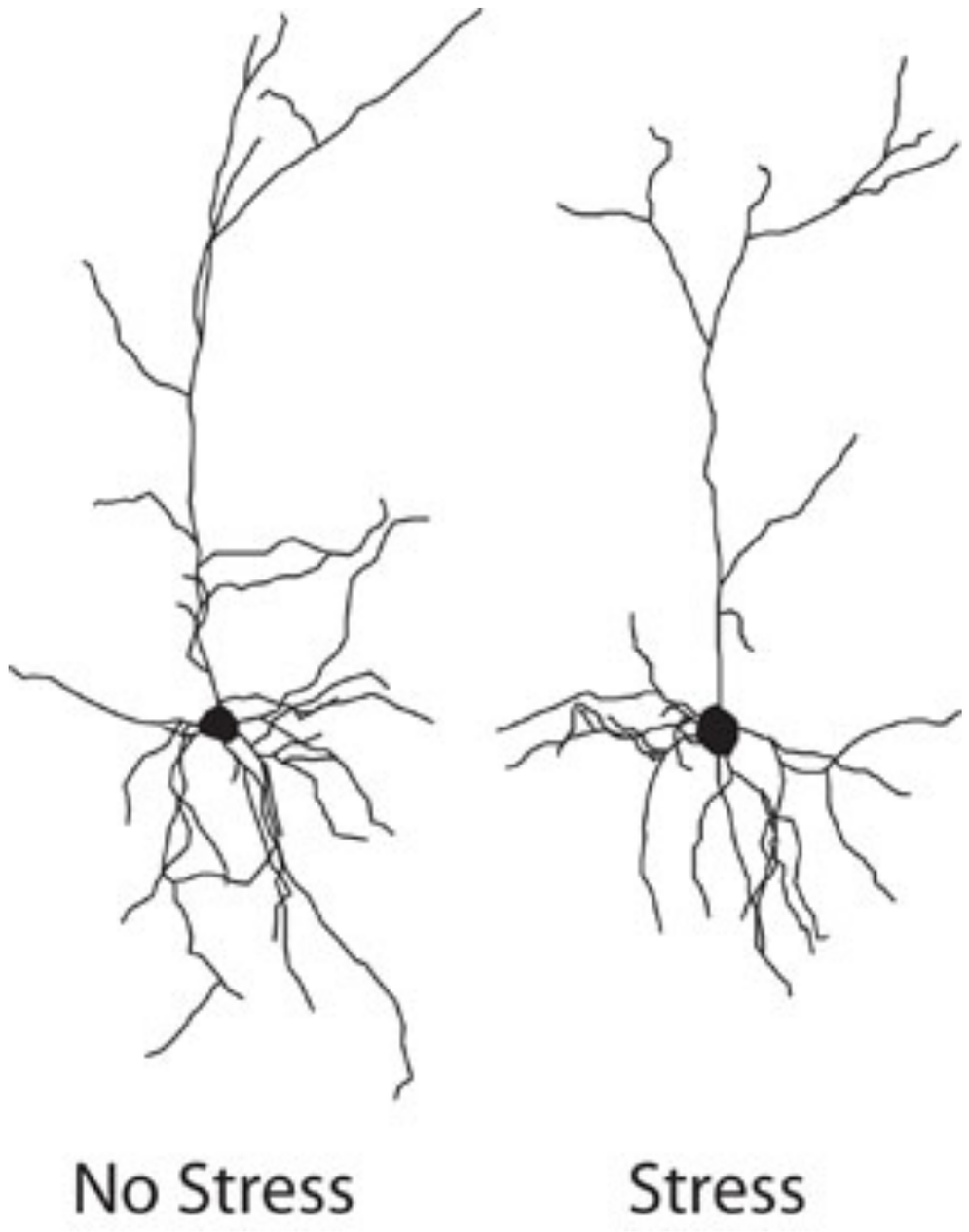
McEwen et al. (2006)

- **Findings:** The treatment rats had weakened dendrites in their frontal lobes and hippocampus than the control rats. They also had stronger neural connections in their amygdala.

- **Conclusions:** Chronic stress brought about by isolation weakens the frontal lobe and hippocampus, while strengthening the amygdala.

- **Critical Thinking?**

Hippocampus Neurons



Learning Outcomes:

- B8: Discuss two effects of the environment on physiological (biological) processes
- B9: Examine one interaction between cognition (memory) and physiology (biology).
- B10: Discuss the use of brain imaging technologies in investigating the relationship between biological factors and behavior.

Bremner et al. (2003)

- **Learning Outcomes:** B8 (effects of environment on physiology), B10 (MRI) - **but LISTED under B7**
- **Aim:** To investigate whether prolonged stress (PTSD) reduces the volume of the hippocampus.
- **Method:**
  - Participants: War veterans and female adults who were sexually abused as children (some had PTSD, but not all).
  - Took MRI scans of brains and had participants take a memory test.

Bremner et al. (2003)

- **Findings:** Veterans with the most memory problems had the smallest hippocampus.
- The hippocampus of PTSD sufferers was smaller than those of control group.
- **Conclusions:** Chronic stress reduces the volume of the hippocampus and impairs memory.
- **Critical Thinking:**
  - Small Sample Size
  - Small Hippocampus leads to PTSD?

STRESS
Essential Questions

- 1. What impact does a stressful experiment have on biological function?
- 2. How does chronic stress affect memory?
- 3. How does cortisol impact human behavior?