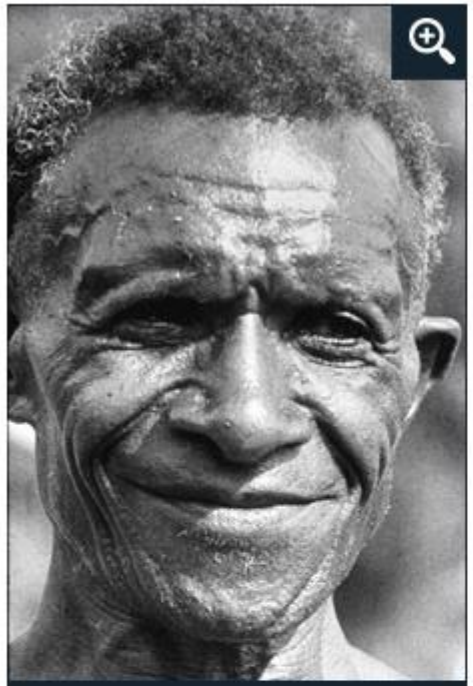
Emotions and Memory

What Is Emotion?

Does everyone emote the same way, are we hard wired?

- Cultural rules about emotion display are different, but physiological responses and conscious feelings associated with human emotions seem to be innate and universal

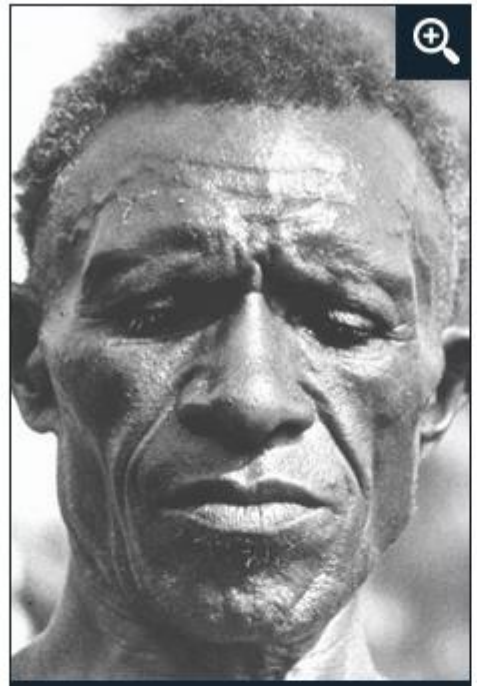


Anger

Sadness

Disgust

Happiness



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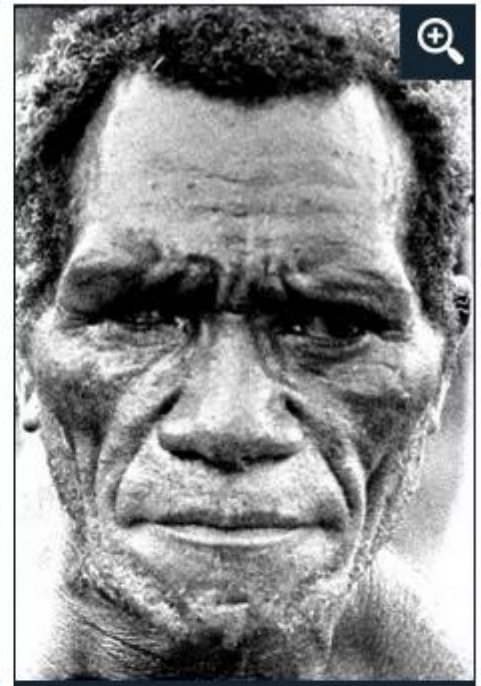

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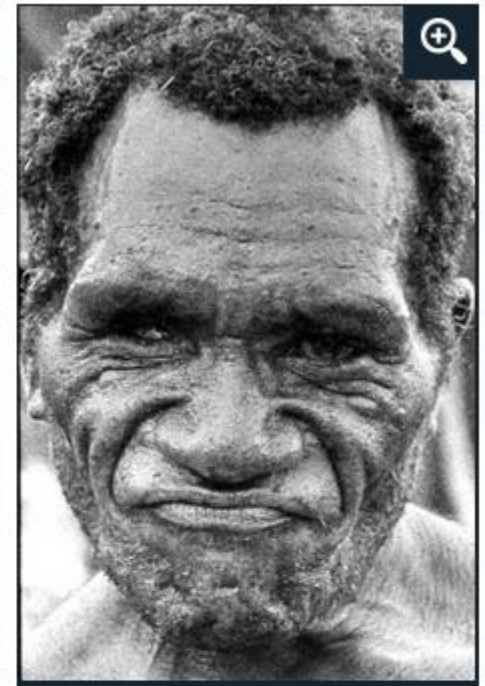
Happiness



Anger

Sadness

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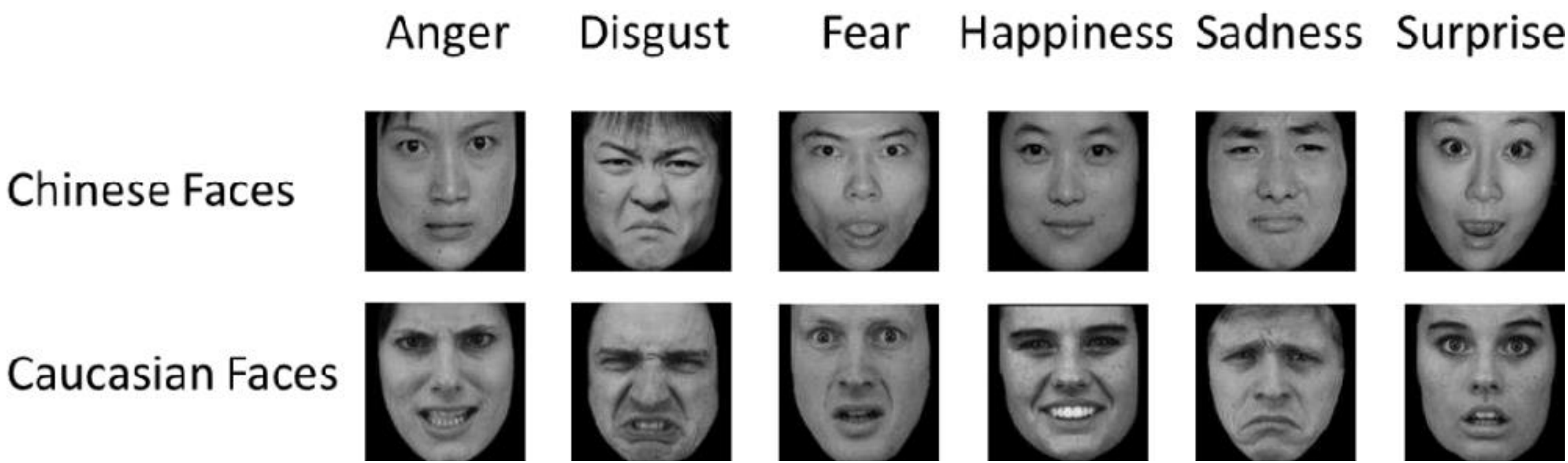

Anger
Disgust
Fear
Happiness
Sadness
Surprise
Chinese Faces
Caucasian Faces

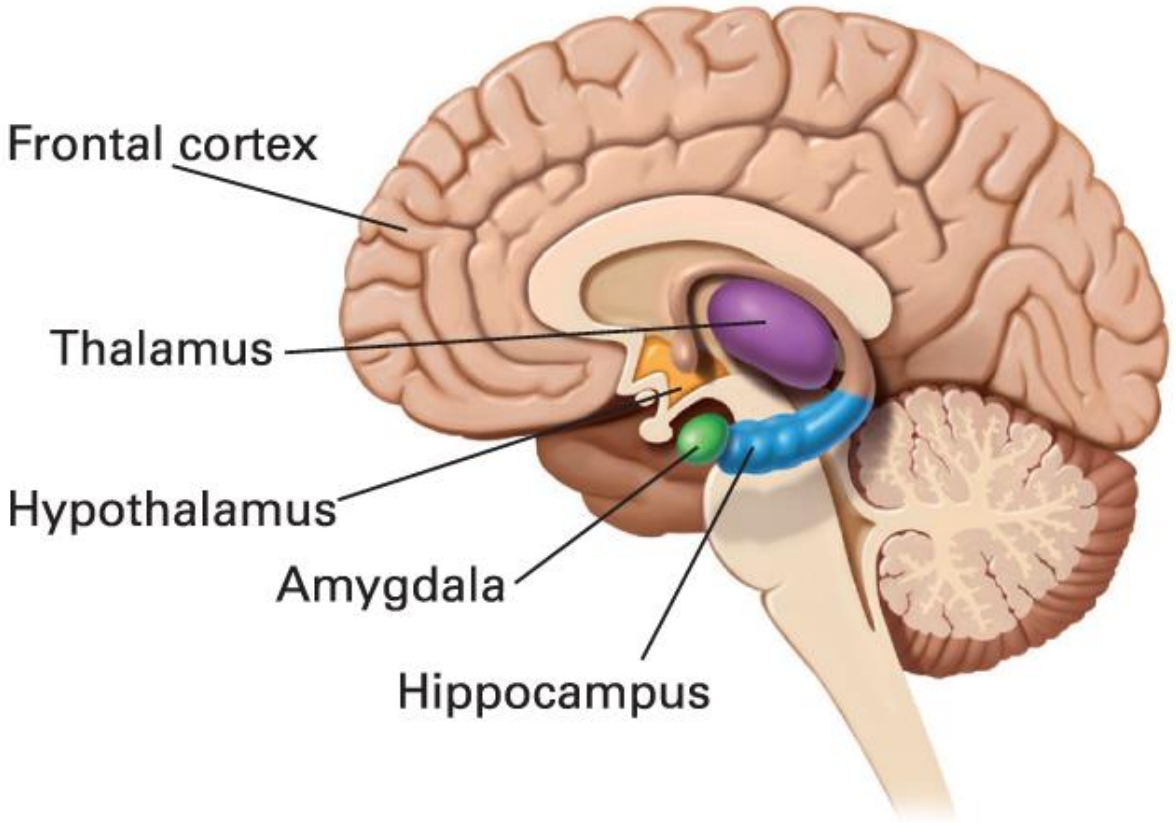
Emotions?

- A small set of distinct emotions are hardwired in humans from birth
  - Happiness, sadness, anger, fear, disgust, and surprise

Emotion: a cluster of three distinct but interrelated sets of phenomena—physiological responses, overt behaviors, and conscious feelings—produced in response to an affecting situation

Ekman & Matsumoto, Japanese and Caucasian Facial Expressions of Emotions

Key Brain Structures in Processing Emotion



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How do emotions hep us?

What is a fear response in humans?

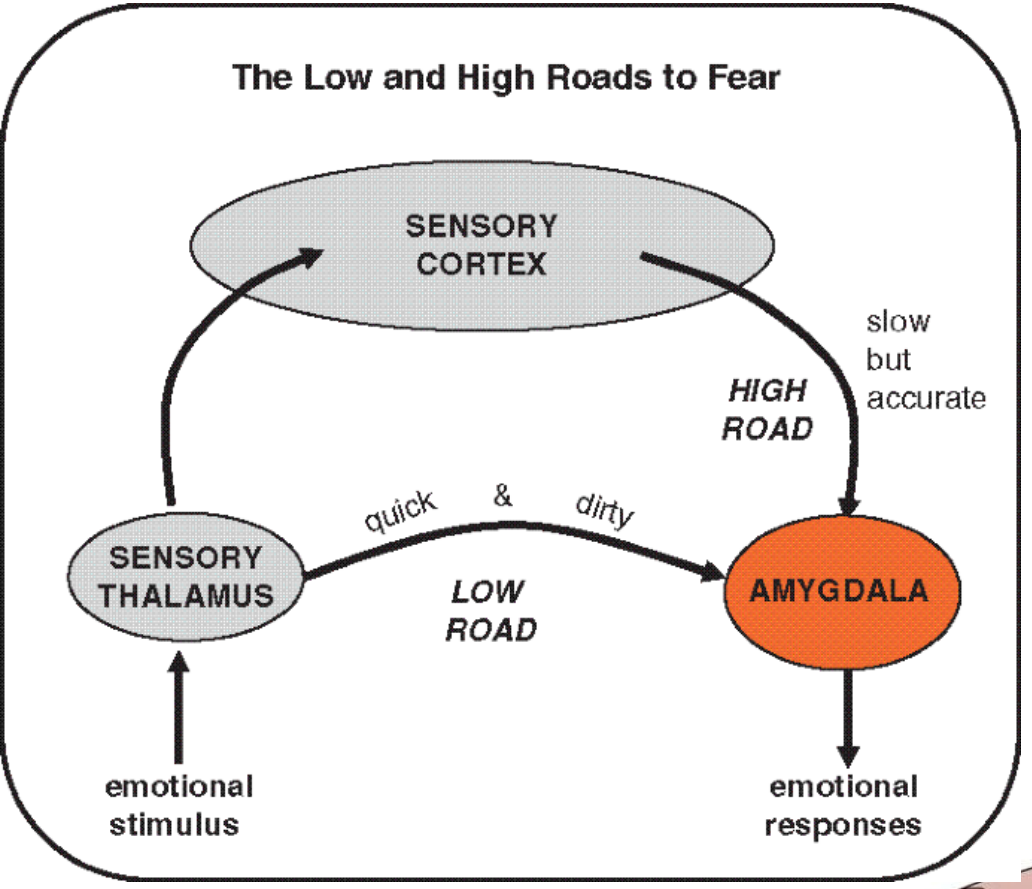
Fight-or-Flight Response (Fear response)

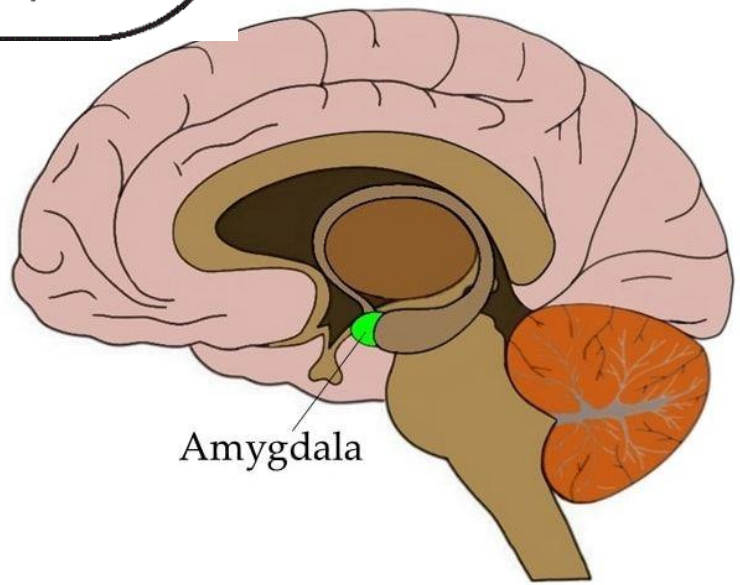
Increases in . . .	**Decreases in . . .**
Blood pressure and heart rate	Digestion
Respiration	Immune system function
Blood glucose level	Sexual arousal
Pain suppression	Touch sensitivity
Perception and awareness	Peripheral vision
Blood flow to large muscles in legs and arms	Growth

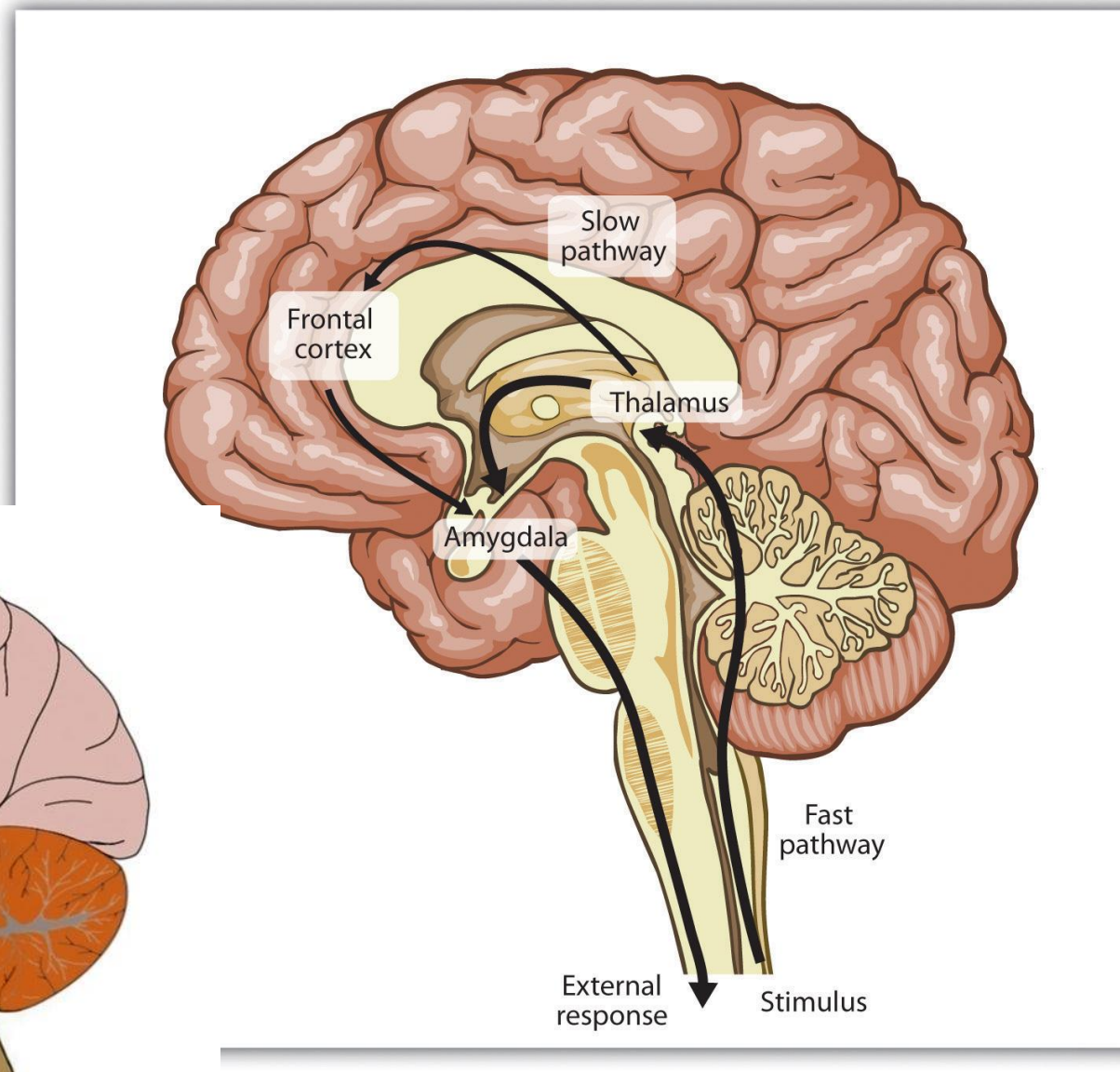
Fear is universal across species and therefore easier to study

Left: Nick Stubbs/Shutterstock; right: Eliot Lyons/Nature Picture Library

Fast vs Slow Fear processing

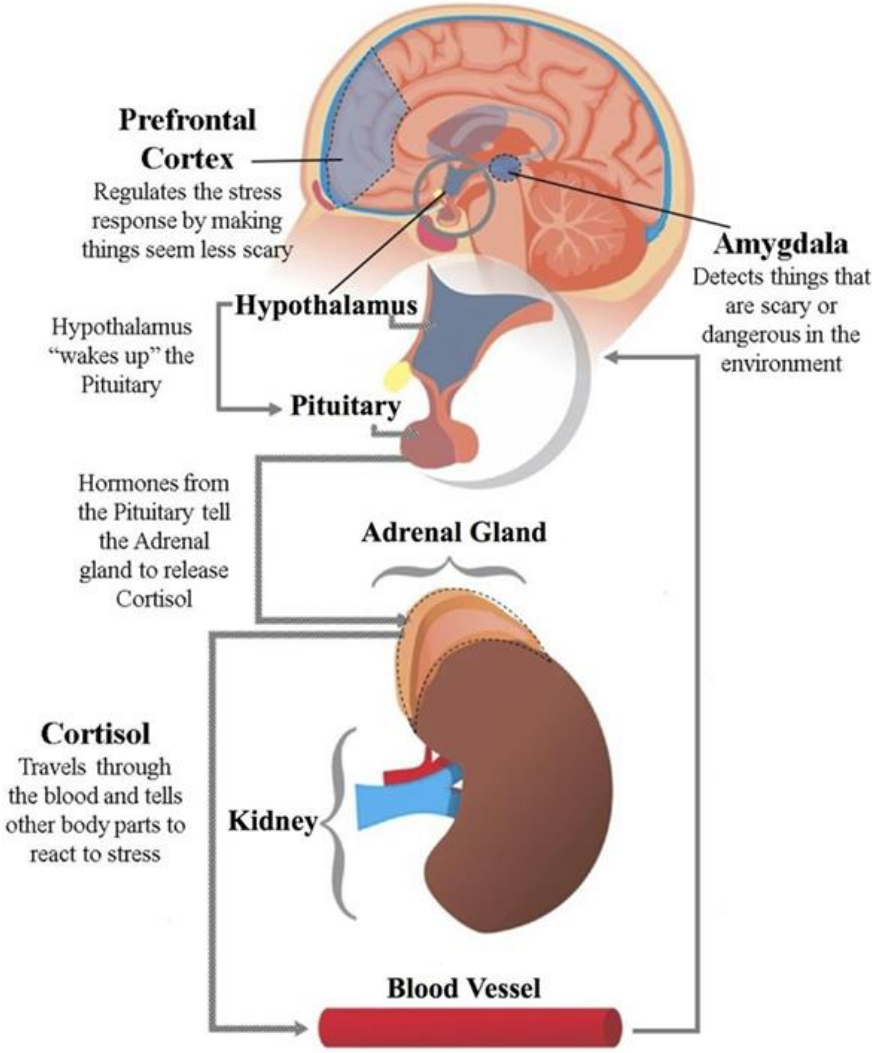


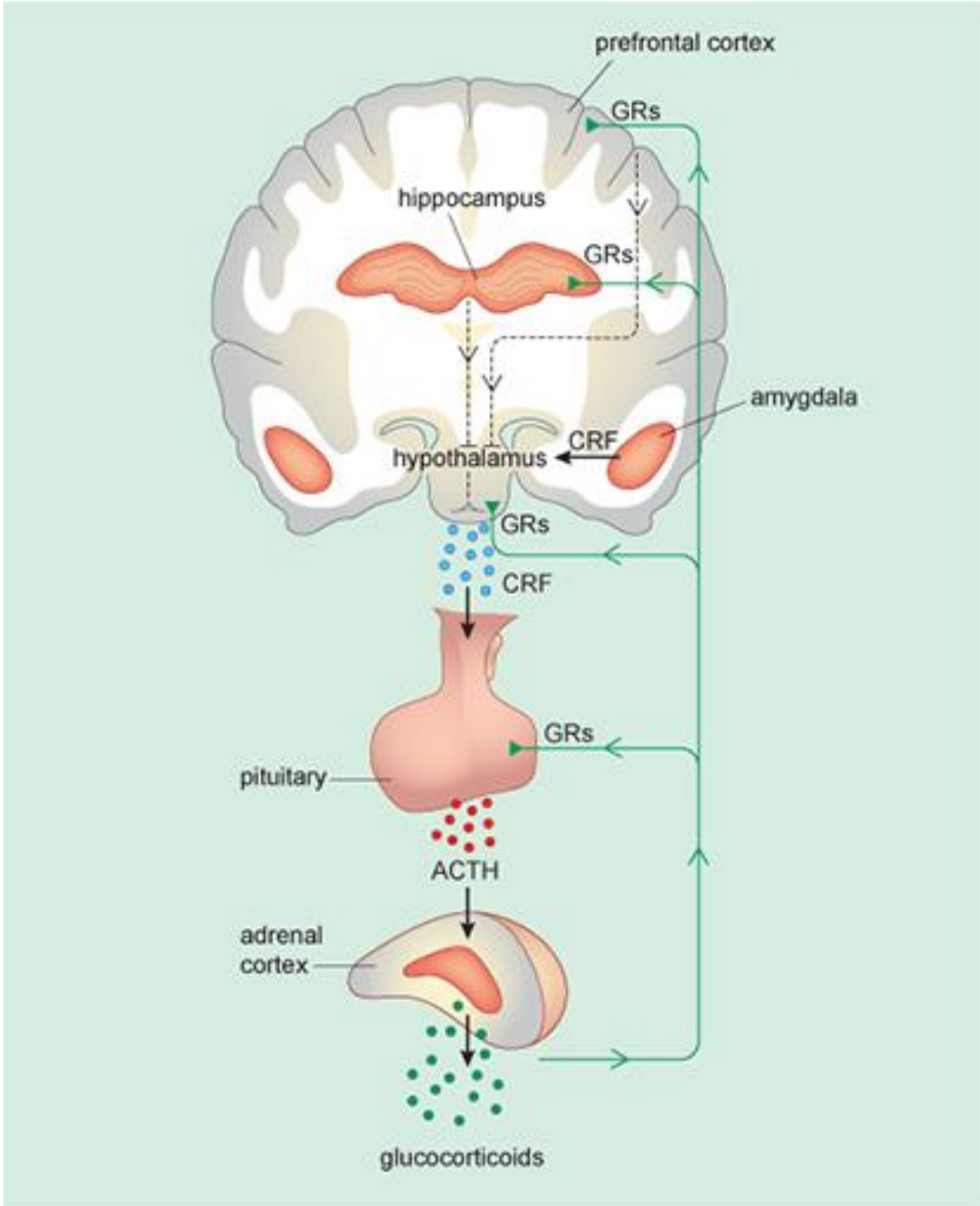


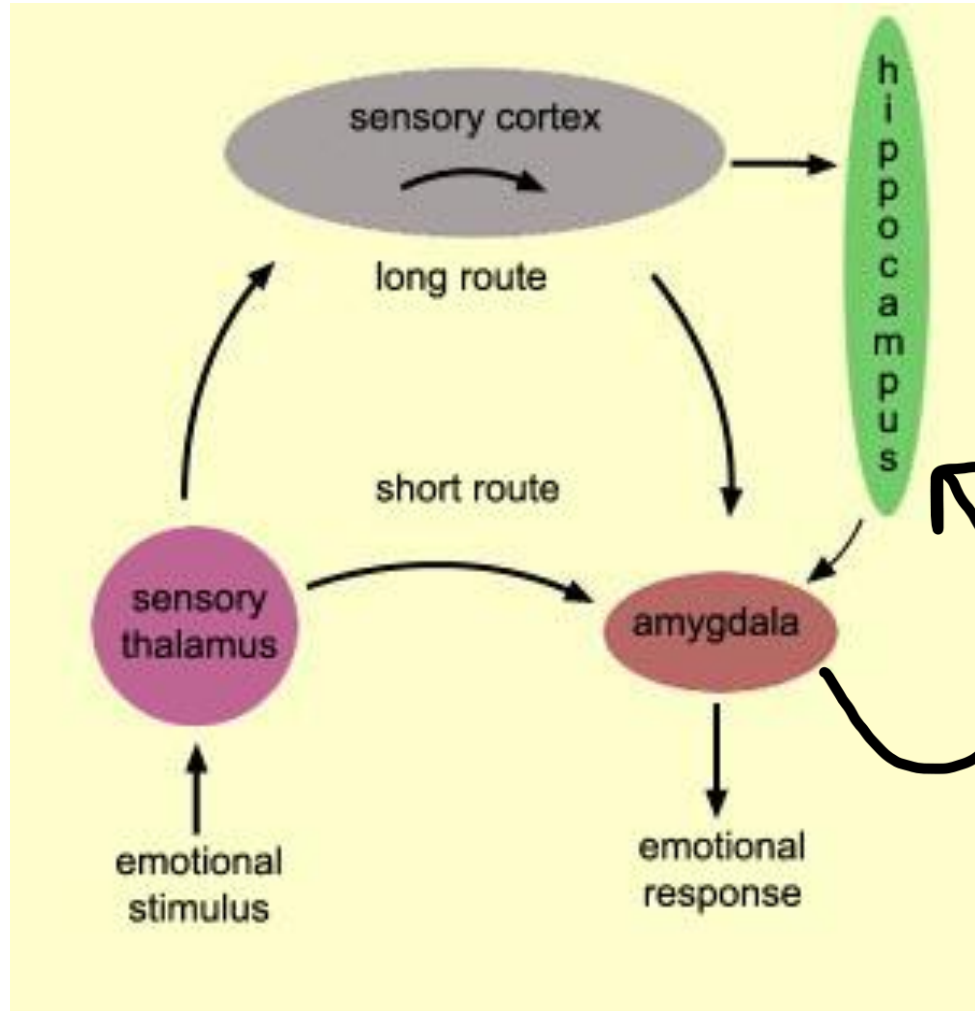


Autonomic Arousal (fear)

- The physiological components of arousal are mediated by the **autonomic nervous system (ANS)**
- When the brain senses a challenge or threat, the ANS signals the adrenal glands to release **stress hormones**
  - Major stress hormones include **epinephrine** (also called **adrenaline**) and **glucocorticoids**
  - The chief glucocorticoid in humans is **cortisol**
- Strong pleasant emotions, such as happiness and surprise, can cause physiological arousal that is very similar to the components of the fight-or-flight response

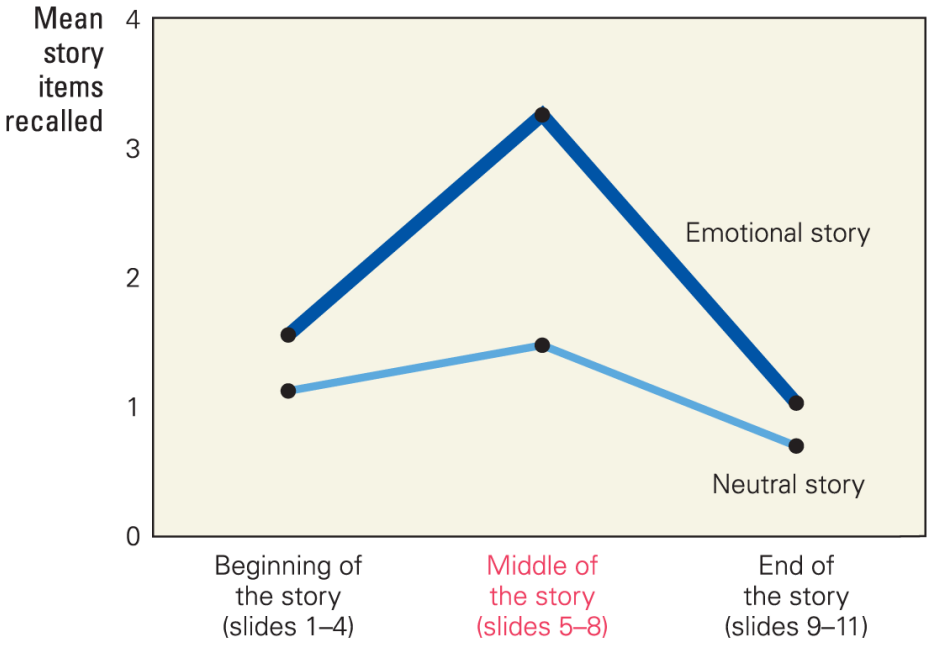



prefrontal cortex
GRs
hippocampus
GRs
amygdala
CRF
hypothalamus
GRs
CRF
GRs
pituitary
ACTH
adrenal
cortex
glucocorticoids


sensory cortex
hippocampus
long route
short route
sensory
thalamus
amygdala
emotional
stimulus
emotional
response

Encoding of Emotional Info.

- Researchers can study the effects of emotional content on the strength and specificity of memories by creating emotional experiences in the laboratory and then testing for memories of them



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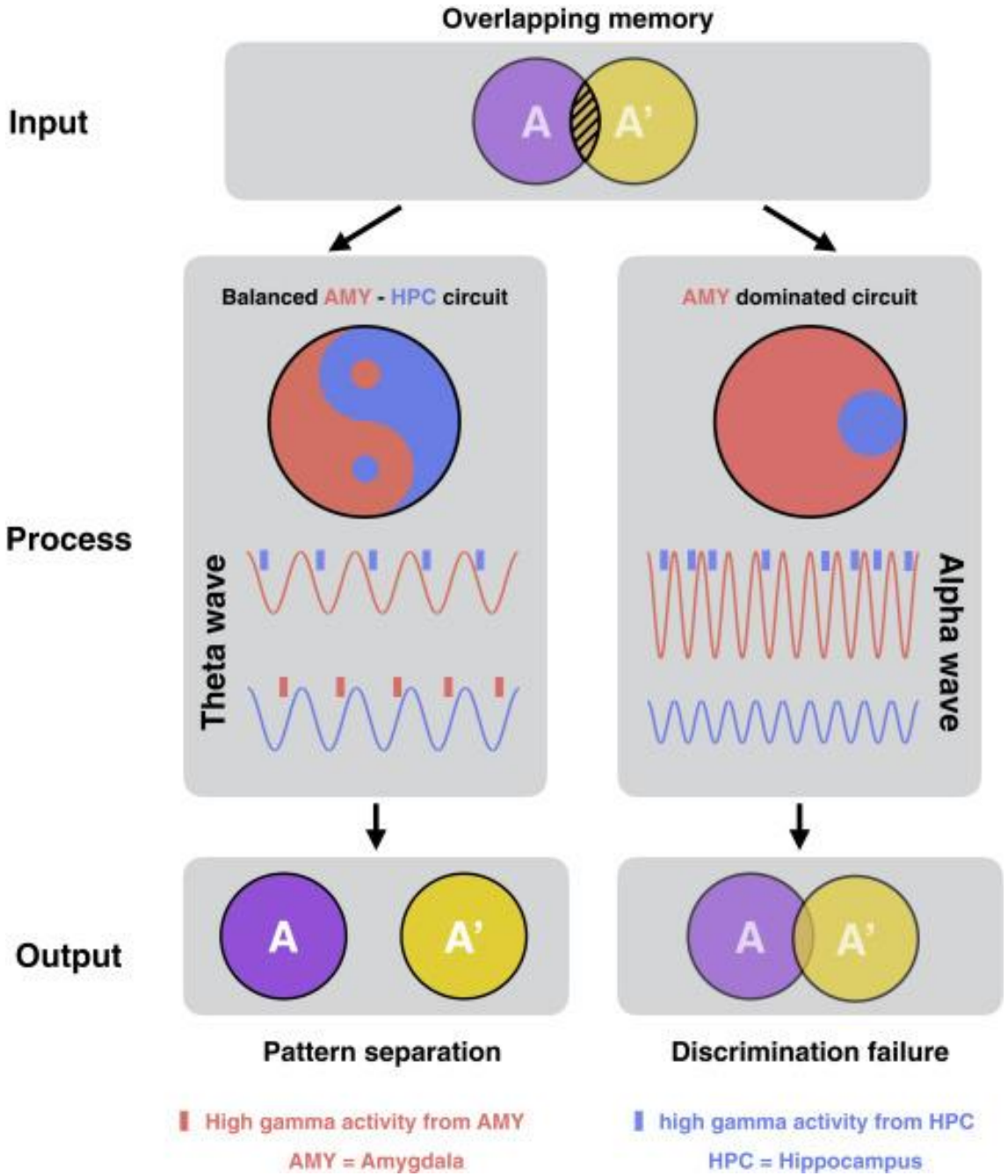
Flashbulb Memories

2008 terror attacks in Mumbai
2011 cricket world cup

- **Flashbulb memory:** a memory formed under conditions of extreme emotions that seems especially vivid and long-lasting

- Flashbulb memories are episodic memories that are experienced with great vividness and confidence, but not necessarily with greater accuracy

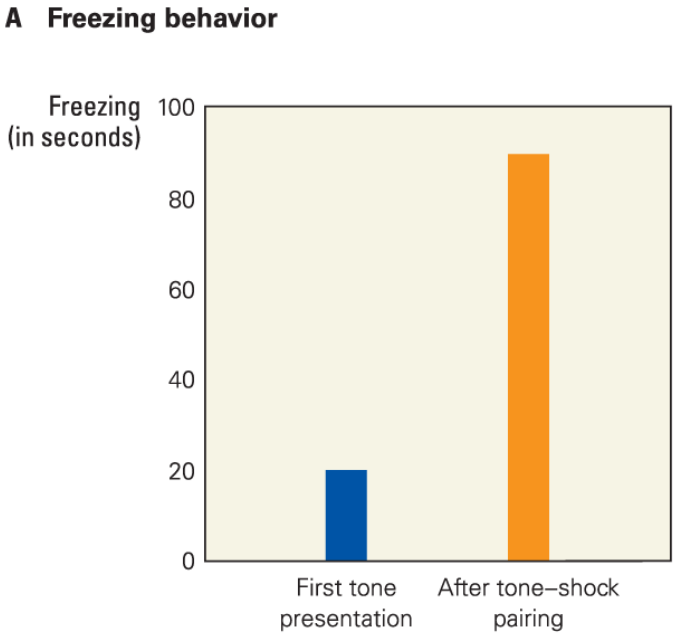
- Studies have shown that while emotion often enhances memory for key events, this benefit does not always extend to background details

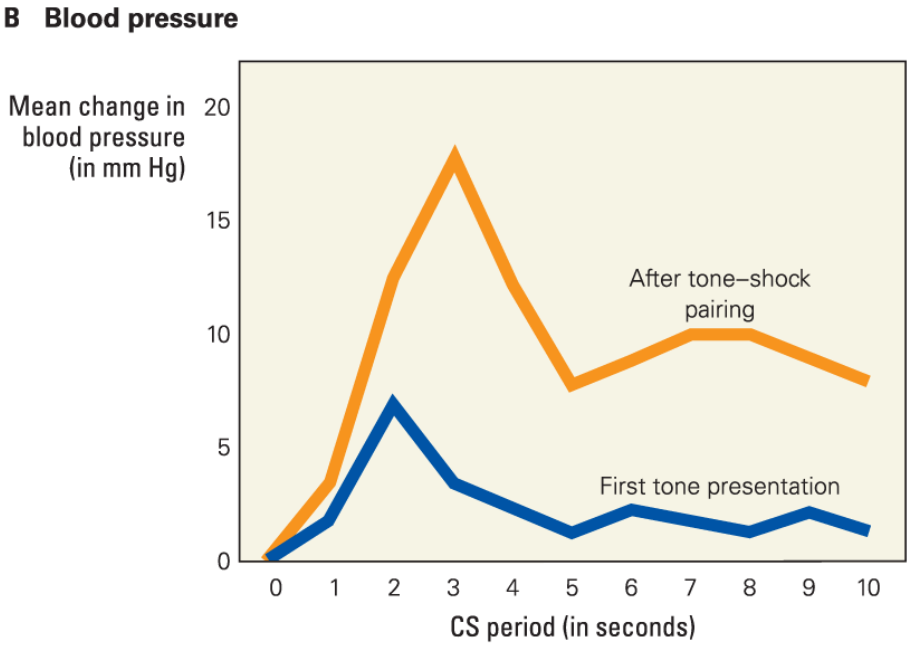


Over-generalization
PTSD

https://www.sciencedirect.com/science/article/pii/S0896627319302880

Can emotions condition us?





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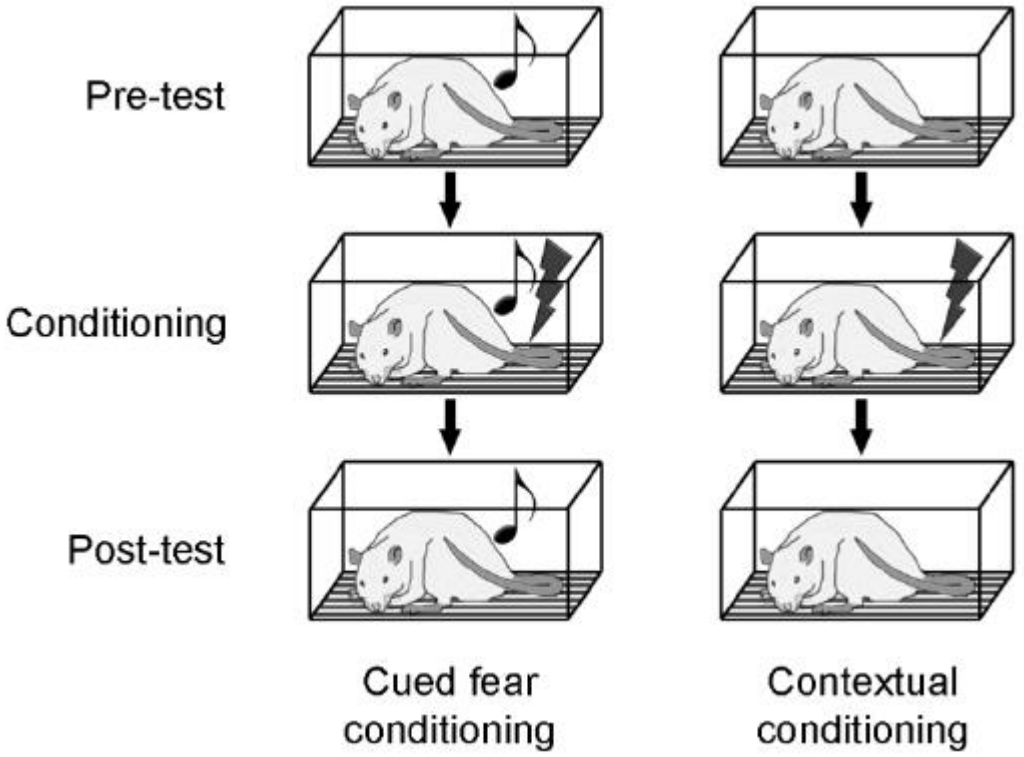
Conditioned Fear Responses
Learning to Predict Danger



Conditioned Avoidance: Learning to Avoid aversive situations

- In **conditioned avoidance**, animals learn to make particular responses to avoid or prevent arrival of an aversive stimulus

E.g. avoiding unpleasant situations

Child not going to school to avoid a strict teacher
Avoiding to take a route due to fear of dogs

Conditioned Escape: Learning to Get Away from aversive situations

- In **conditioned escape**, animals learn to make particular responses in order to escape from or terminate an aversive stimulus
- Escape learning is a form of operant conditioning

Discriminative stimulus S^D (shock initiation) → Response R (lever press) → Outcome O (escape from shock)

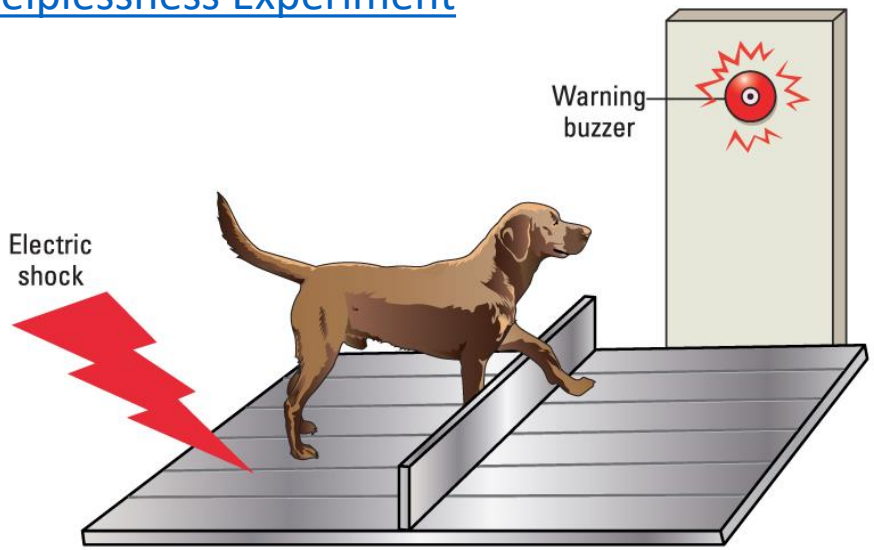
E.g. every time a mother opens a book to take HW the child starts to cry or throw a tantrum

- What if an animal or human cannot escape a fearful or stressful situation, repeatedly, over time?

Learned Helplessness

- Seligman concluded that the prior exposure to an inescapable shock (during the classical-conditioning phase) had taught the animals that they were helpless to escape *any* shock—even in the operant-learning phase

[Seligman's Learned Helplessness Experiment]



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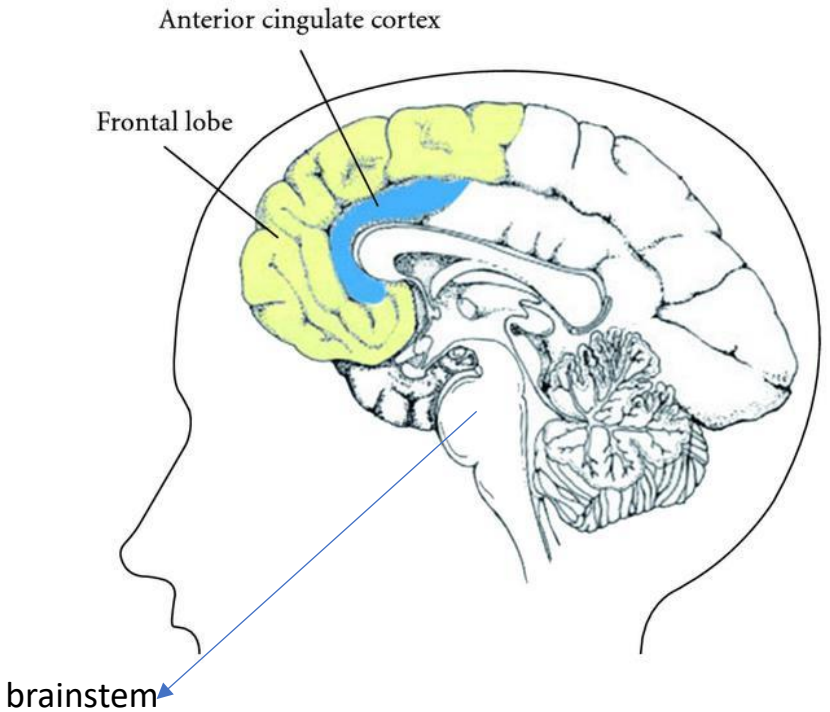
E.g. bullying, sexual harassment, domestic violence, child abuse

Learned helplessness

- An individual comes to believe that they are unable to control or change the situation, so they do not try — even when opportunities for change become available.
- They accept that the stress causing factor is part of their life
- The PFC plays a roles in reducing learned helplessness by inhibiting the helpless behaviour.
- Leads to increased feelings of anxiety and depression



Understanding this phenomenon may provide clues for how to treat or protect against **depression**

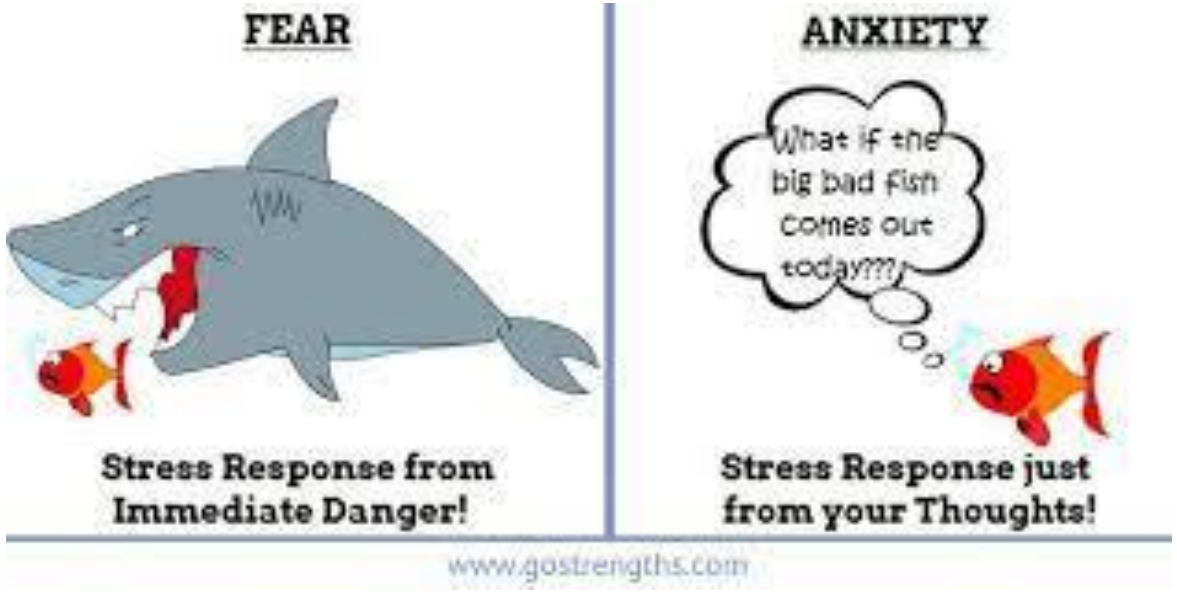
- How is stress different from anxiety?

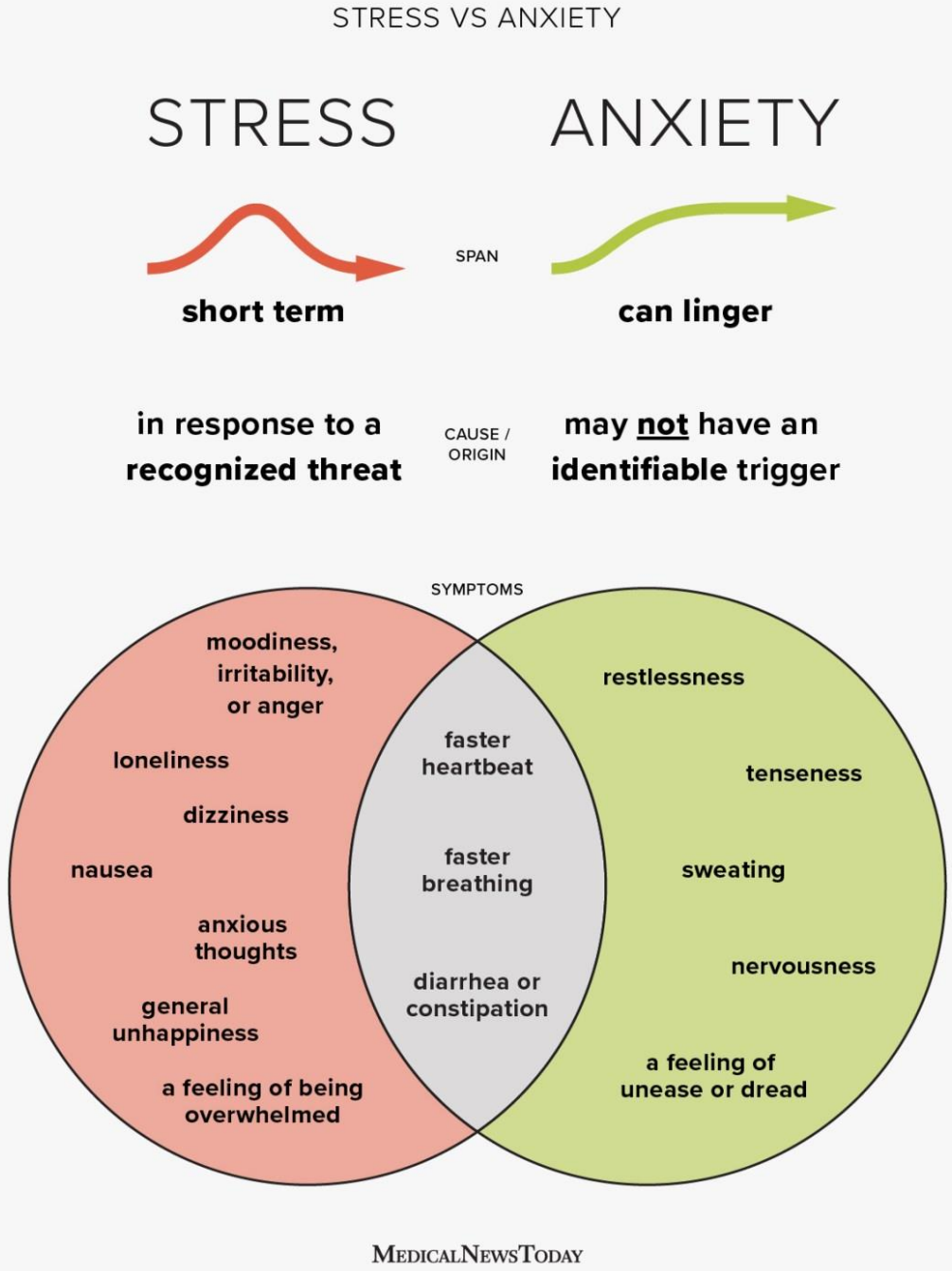
Anxiety

- Persistent worry or apprehension (in absence of a stressor)

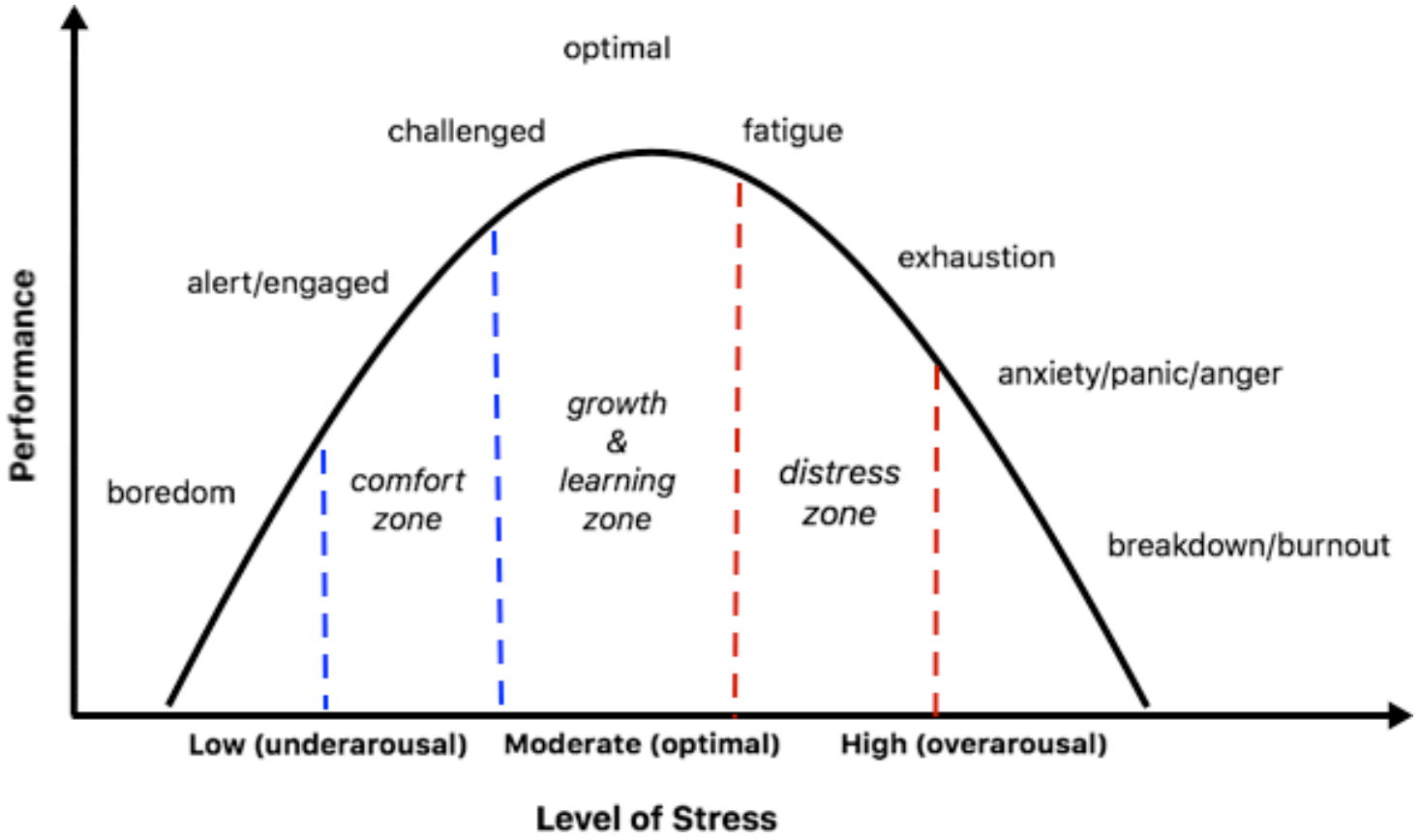
Stress

- Response to a threat or stressor (an ongoing situation)

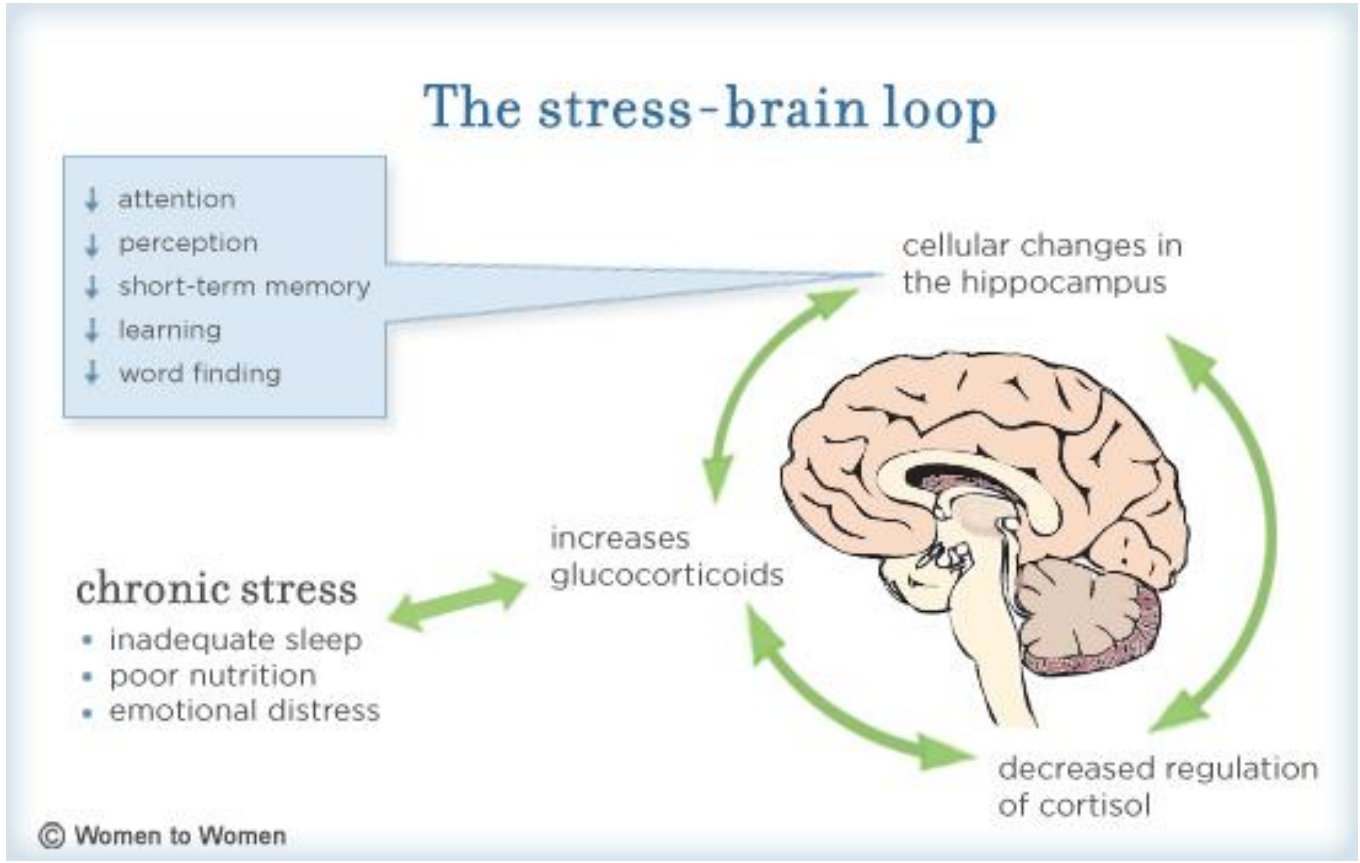


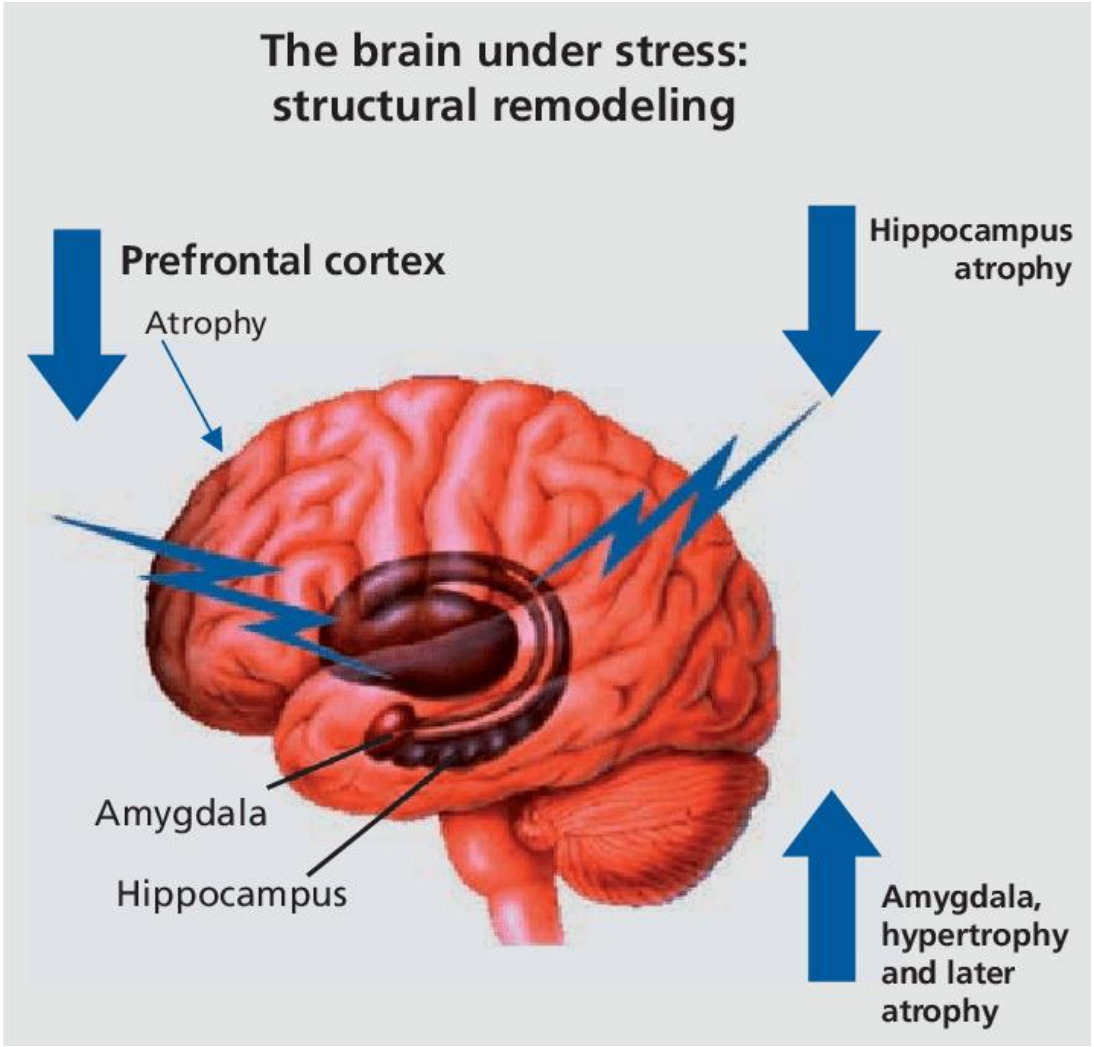


Effects of short-term/acute stress



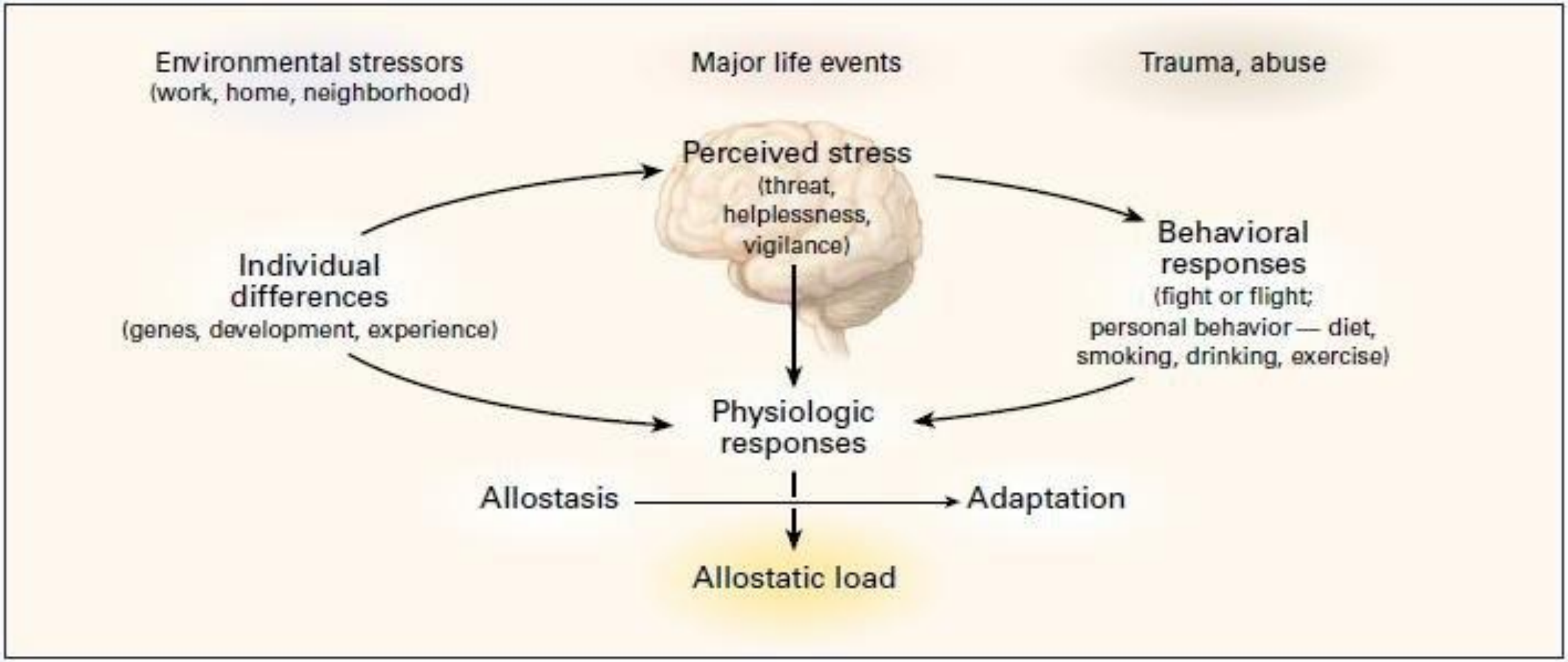
Chronic stress or anxiety → Depression (in some people)





Chronic stress or anxiety → Depression (in some people)

- Sleep
- Cardiovascular diseases (diabetes, hypertension, heart attacks)
- Increased Inflammation (autoimmune diseases)
- Faster Aging


Environmental stressors
(work, home, neighborhood)
Major life events
Trauma, abuse
Perceived stress
(threat, helplessness, vigilance)
Individual differences
(genes, development, experience)
Behavioral responses
(fight or flight; personal behavior — diet, smoking, drinking, exercise)
Physiologic responses
Allostasis
Adaptation
Allostatic load