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Anxiety and the Neuroscience of the Fear Response

Stress Response

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- “Men are disturbed not by things, but by the views which they take of them.” - Epictetus, Greek philosopher
- “It is not what happens to you that matters, but how you take it” - Hans Selye, father of modern endocrinology

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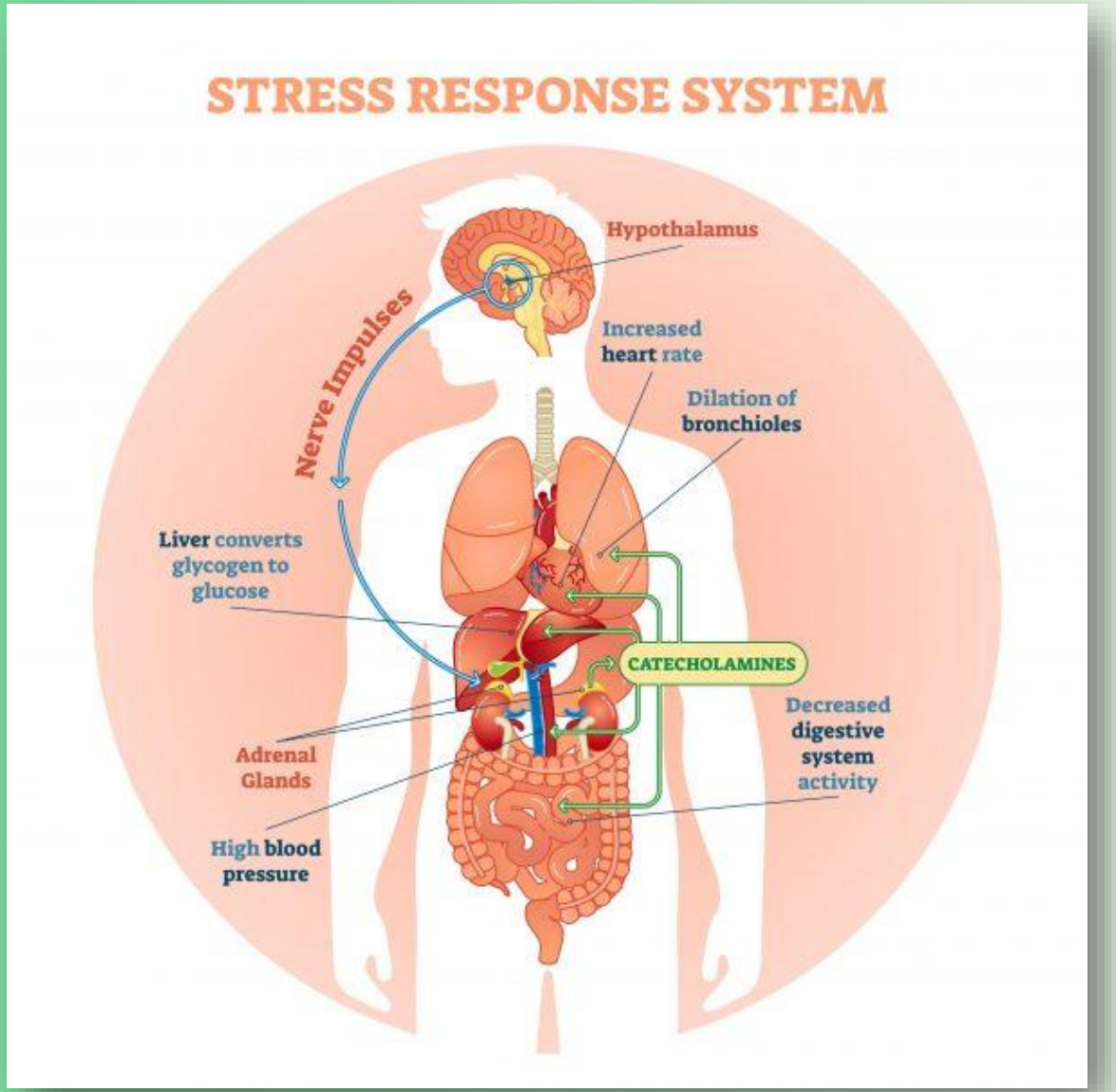

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It’s not the leopard chasing us anymore…

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NATION NOW

Your cat may want to kill you, study says

Mallory Davis KUSA-TV, Denver

Published 5:52 p.m. ET Oct. 31, 2015 | **Updated 11:51 a.m. ET Nov. 1, 2015**

Remember, your lovable kitty is neurotic -- and has fangs. *Mallory Davis, KUSA-TV, Denver*

What is the Stress Response?

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- Stress is commonly defined as a state of real or perceived threat to homeostasis.
- Maintenance of homeostasis in the presence of aversive stimuli (stressors) requires activation of a complex range of responses involving the endocrine, nervous, and immune systems, collectively known as the stress response.

(Smith and Vale, 2006)

Divisions of the Nervous System

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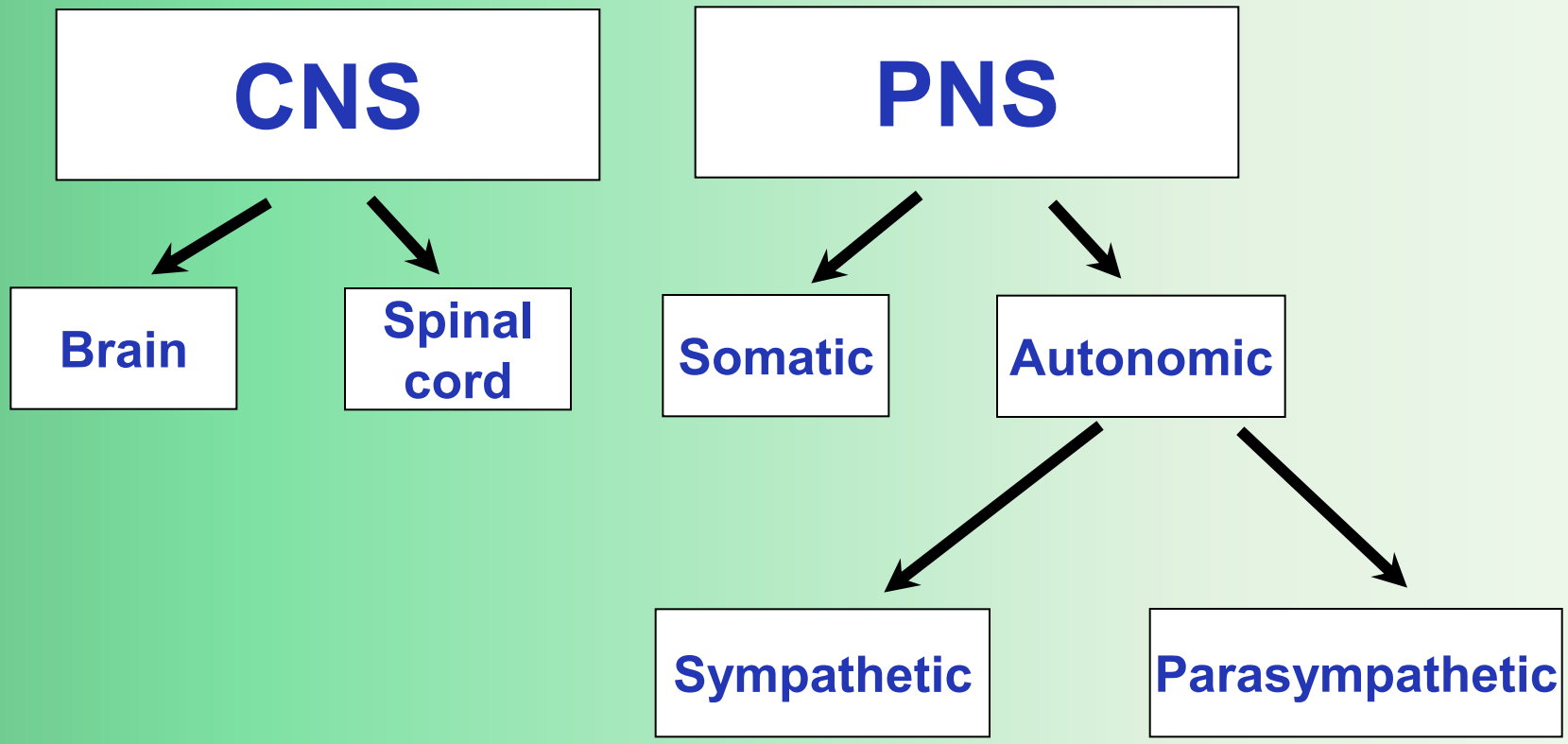

Rapid Response to Stress

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- Adrenal medulla releases epinephrine and norepinephrine
- These increase heart rate, increase blood pressure, dilate pupils, increase respiratory rate, increase glucose use by the muscle, increase awareness
- Fight, Flight, or Freeze
- This occurs within seconds

The Hypothalamic-Pituitary-Adrenal Axis (HPA)

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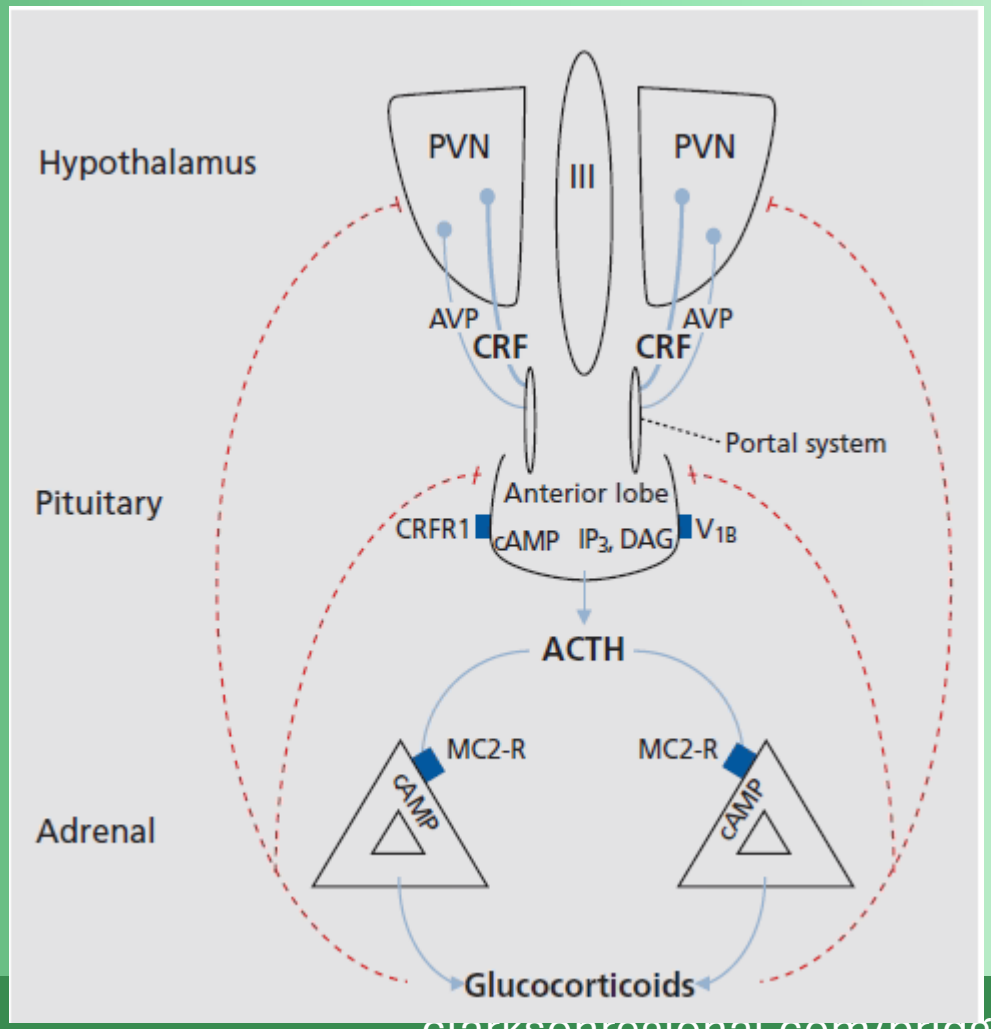

- Paraventricular nucleus releases Corticotrophin-releasing factor (CRF)
- CRF goes to the anterior pituitary where it releases ACTH
- ACTH travels to adrenal glands where it releases cortisol
- Cortisol travels to organs where it binds to glucocorticoid receptors and mineralocorticoid receptors
- It then turns off CRF release

Features of Anxiety
Sympathetic Nervous System

- Pupil dilation
- Muscle contraction
- Increased HR
- Decreased GI mobility
- Decreased libido
- Increased vigilance

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- Subjective feelings of danger, threat
- Urge to flee

Anxiety Sensitivity

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- Exaggerated response to physiological alterations associated with anxiety and fear
- Initiates positive feedback loop which leads to more anxiety and fear
- Cognitive bias towards threat
- Temperamentally based
- Target of psychotherapy

Stress and Resilience

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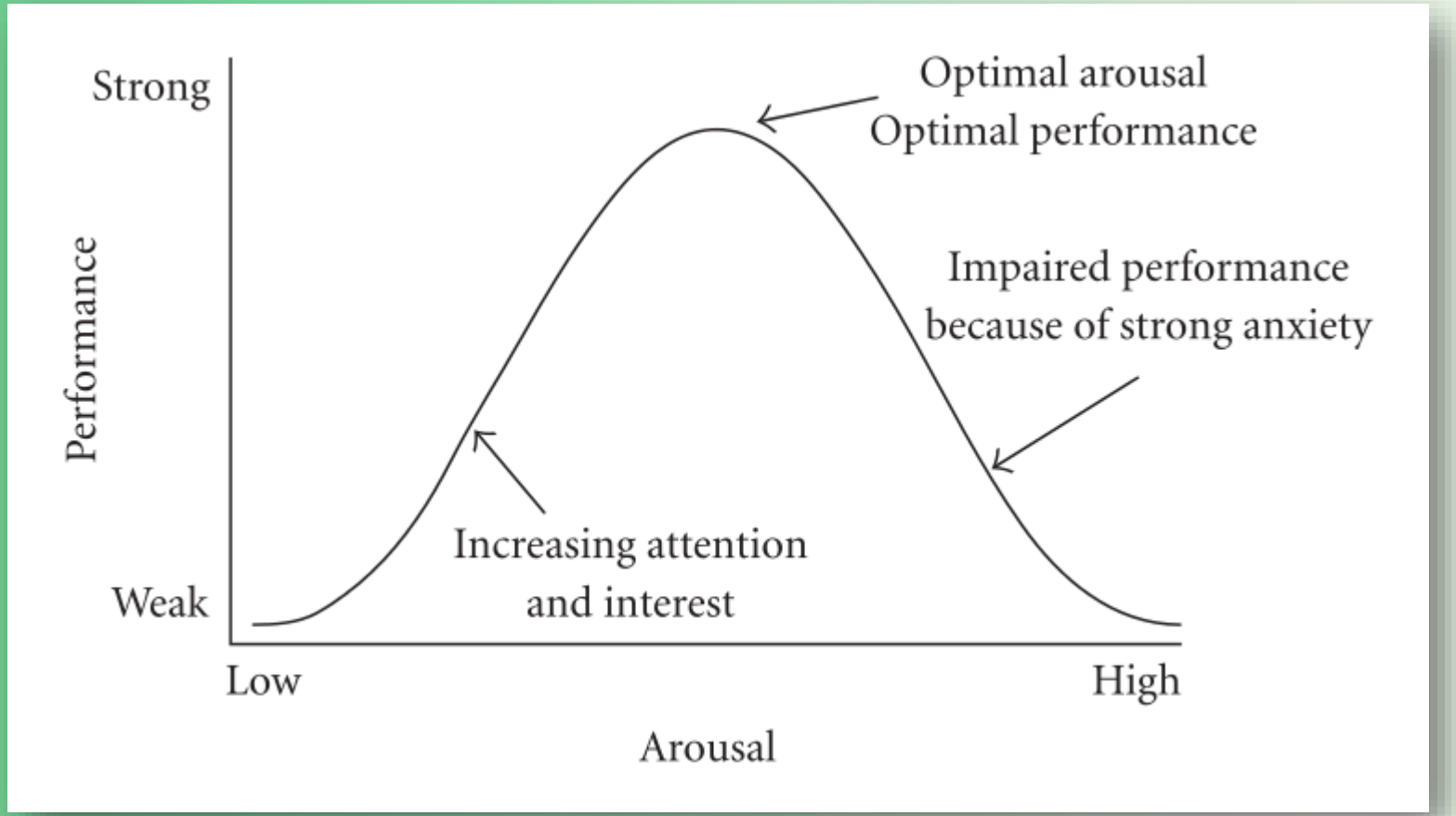

Yerkes and Dodson (1908)

Stress Inoculation

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- Squirrel monkeys exposed to repeated, short maternal separations show some immediate signs of distress, which are slowly reduced over time.
- These monkeys show diminished HPA activation in response to subsequent acute stressors and are better able to regulate negative emotional arousal to later acute stressors.

Three concepts that people perceive as resulting from stressful life events

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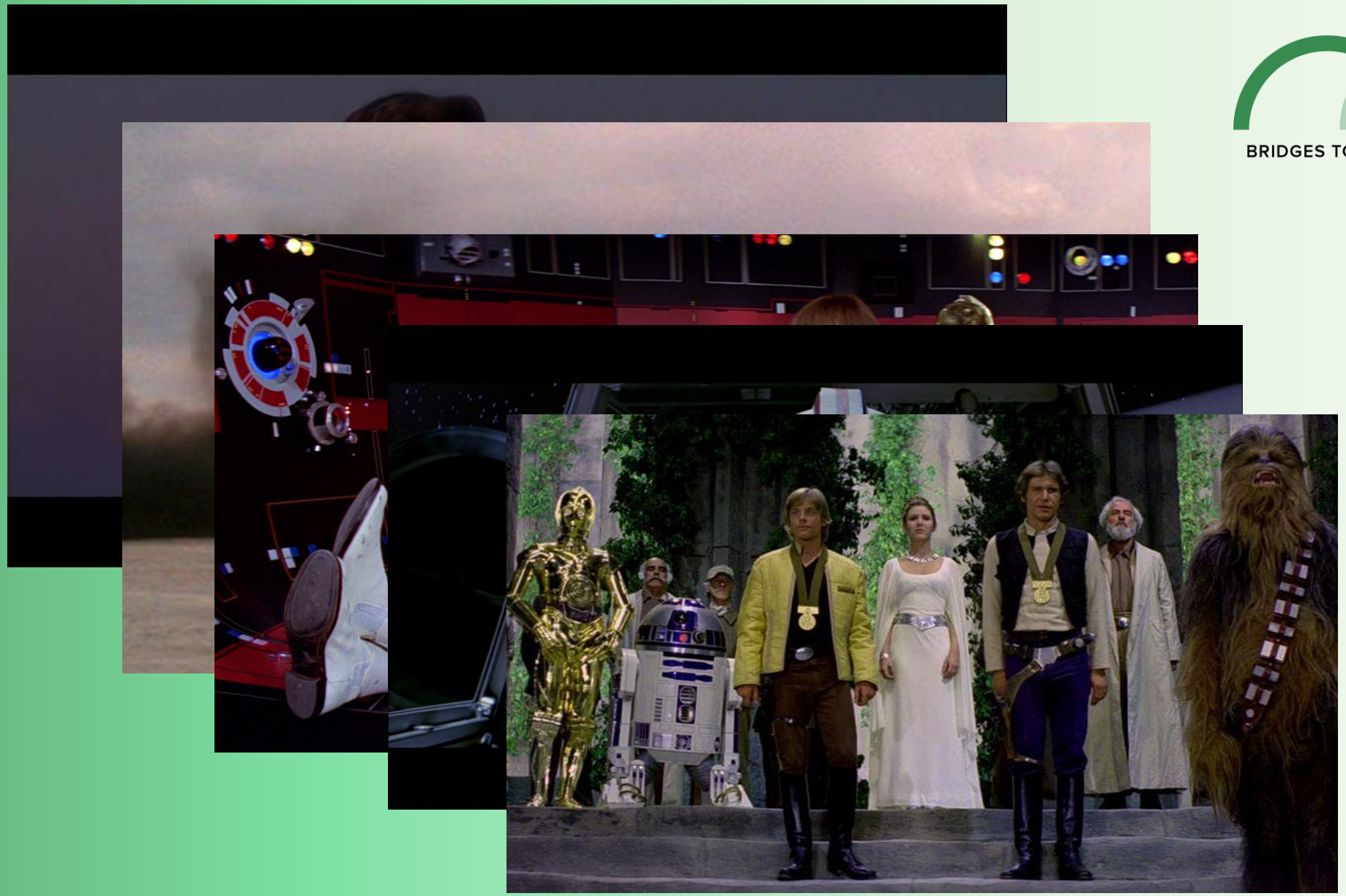
- Changes in self-concept
- Relationships with social networks
- Personal growth and life priorities



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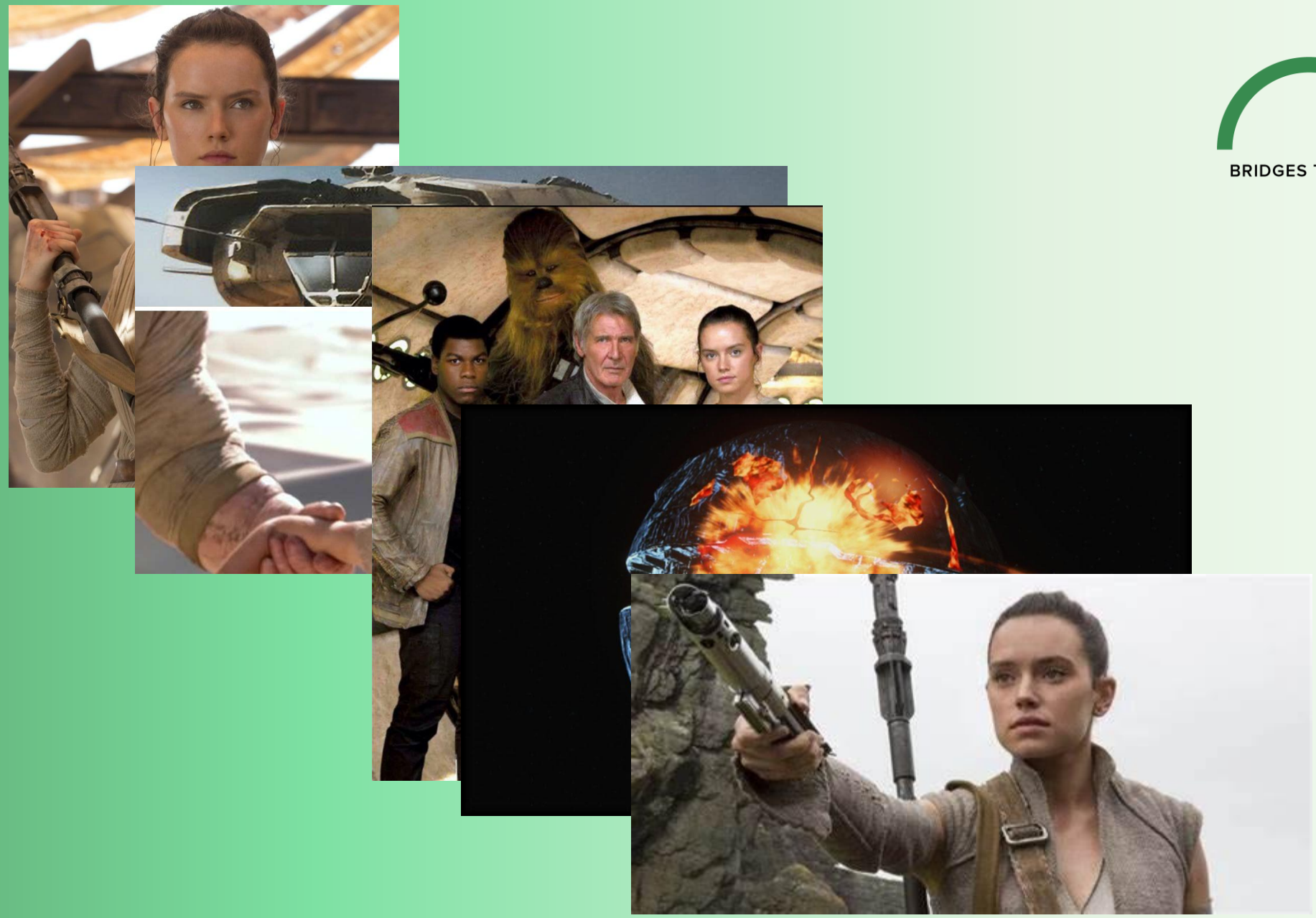

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Circuits of Resilience

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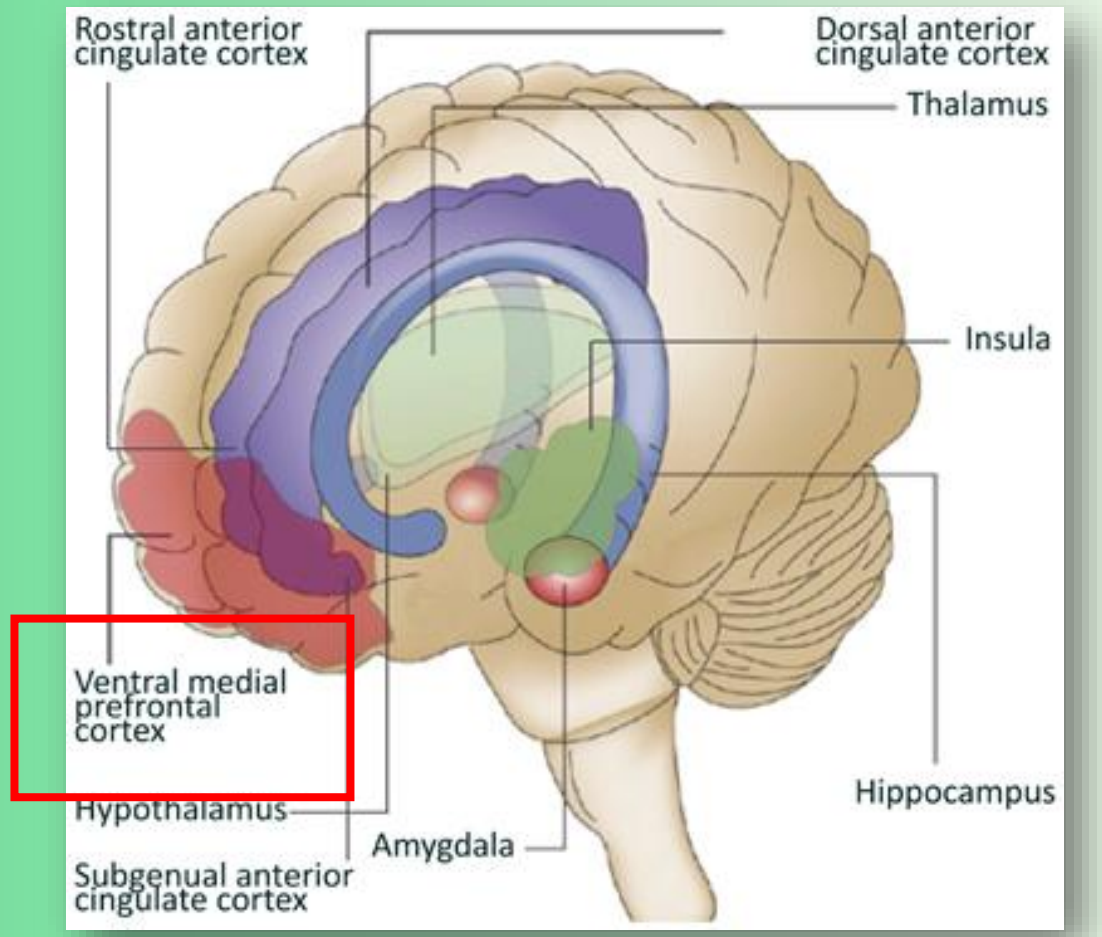

van der Werff et al (2013)

Summary

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- Anxiety disorders are co-opting the typical circuitry that has evolved to respond to acute and chronic stress
- There are multiple brain regions involved, including the amygdala, HPA axis, ventral striatum, and prefrontal cortex
- Thus far, there are no reliable brain structural changes that are sensitive or specific enough to diagnose anxiety disorders