



Performing under Pressure; on the Biology, Psychology and Sociology of stress in high-performance professions

II - ON THE PHYSIOLOGY OF STRESS



Nature selects for speed

- ▶ Speed over accuracy
 - ▶ It matter less where you run than that you run as quickly as possible
- ▶ Limited time frame (5 min)
 - ▶ Most negatives effects of stress are the result of turning on the system for way longer than the approximately 5 minutes it usually takes.

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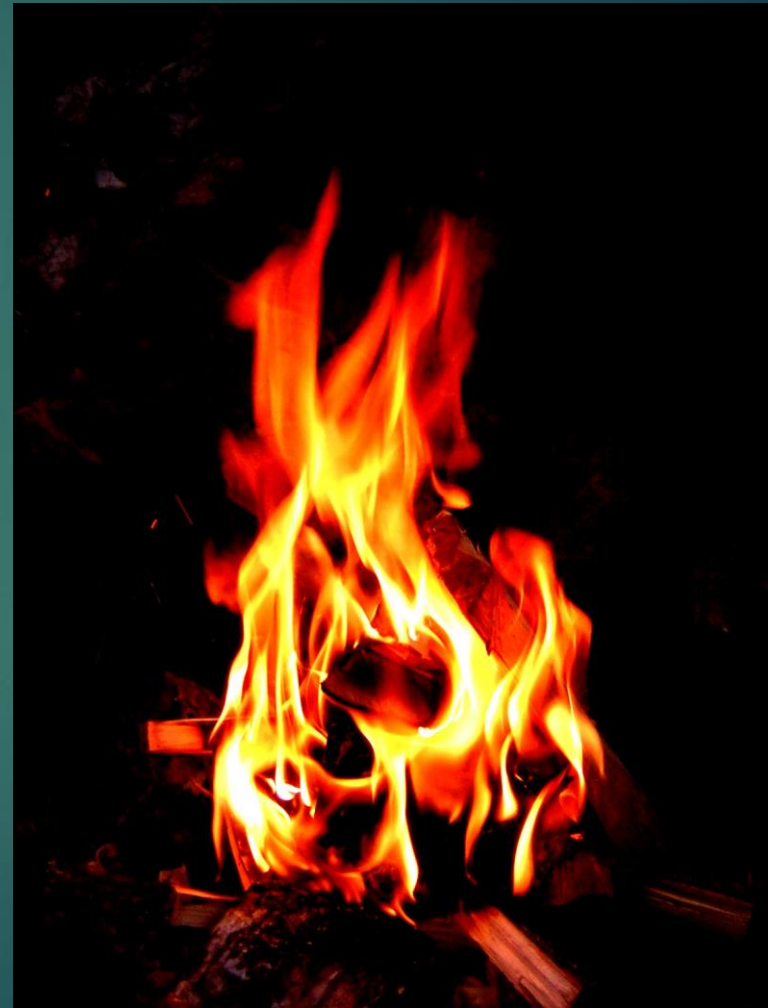
Heitz, R. P. (2014). The speed-accuracy tradeoff: History, physiology, methodology, and behavior. *Frontiers in Neuroscience*, 8(8 JUN), 1–19. <https://doi.org/10.3389/fnins.2014.00150>

Both the lion and the gazelle need the same acute processes to survive

- ▶ Transport energy (fuel + oxygen) to those parts of the body that you need to survive
 - ▶ Legs
 - ▶ Upper body
- ▶ Hyper cognitive focus on the task at hand (fight or flight)
- ▶ Down-regulation of non-essential processes

Energy

- ▶ Oxygen in-take and transport to the relevant muscle groups
 - ▶ Increased respiration rate
 - ▶ Increased blood pressure / increased heart rate
- ▶ Release of glucose from glycogen stores and transport to the relevant muscle groups
 - ▶ Cortisol
 - ▶ Increased blood glucose levels
 - ▶ Increased blood pressure / increased heart rate



Important cognitive changes

- ▶ Mild stress
 - ▶ Enhanced cognitive function; implicit memory & declarative tasks
 - ▶ Enhanced task oriented focus
- ▶ High acute or chronic stress
 - ▶ Impairs the formation of complex memories: enhances implicit memory
 - ▶ Repetitive tasks

Downregulated functions

- ▶ Growth
- ▶ Reproduction
- ▶ Digestion



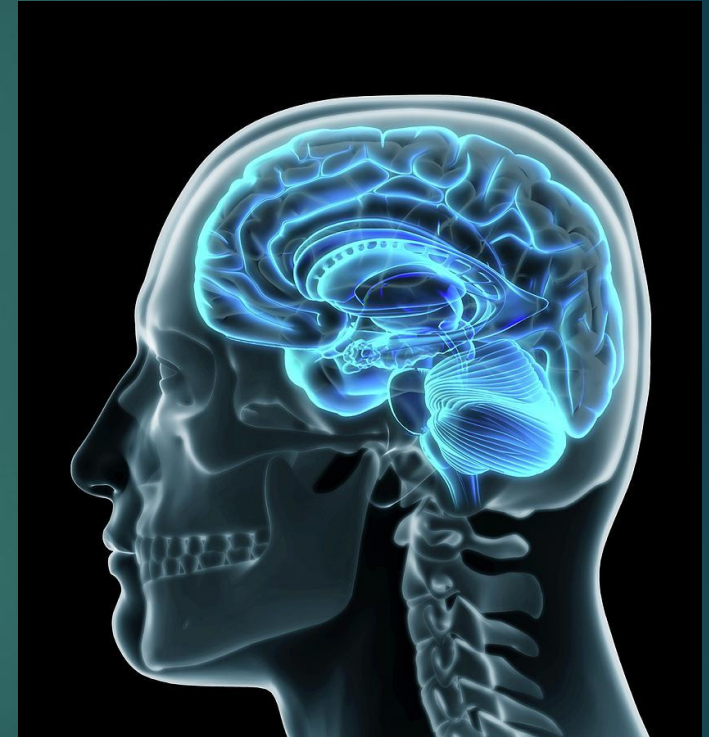
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Processing stimuli; the hardware

- ▶ A stimulus is detected by one of our senses
- ▶ The amygdala relays signals if the stimulus is threatening
 - ▶ Locus coeruleus (Norepinephrine)
 - ▶ Hypothalamic adrenal axis (Cortisol)
 - ▶ Ventral tegmental area (Dopamine)
 - ▶ Medial prefrontal cortex



Autonomic nervous system

- ▶ Sympathetic nervous system
- ▶ Parasympathetic nervous system

(nor-)adrenaline / (nor-)epinephrine

- ▶ Setting the system up for movement
 - ▶ Blood pressure / heart-rate
 - ▶ Respiration rate
 - ▶ Task related focus and memory
- ▶ Heightened alertness & stressor related memory
- ▶ Three behavioural stages of nor-adrenaline
 - ▶ Movement
 - ▶ Erratic movement (panic)
 - ▶ Shutdown

Cortisol

- ▶ Release glucose (fuel) from glycogen stores
 - ▶ Highest in the morning
 - ▶ Nightmares
 - ▶ Interaction with nutrition
- ▶ Suppress inflammation
- ▶ Blood pressure

What does dopamine do to the stress response

- ▶ Dopamine: the great motivator (NO, it does not do reward!!)
 - ▶ Training
 - ▶ Uncertainty

