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The Science of Health and Happiness

The Biology of Mind-Body Connections

Notes & Resources

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Basic biology and anatomy of the brain



- **We have an immensely complex body with many integrated systems** – it has been estimated that the human body contains approximately 37.2 trillion cells.
- Our brains and minds are intimately connected to the rest of the body, as well as our social and physical environments; ***happiness is dependent on healthy interactions between all of these systems.***
- **The human brain can be divided into hemispheres** – although, the reality is more complex, broadly speaking, the *right hemisphere* is concerned with spatial, and tactile awareness as well as creativity; *it carries the music of events.* The left hemisphere is associated with *facts & stats – it does the talking.*
- **The brain was built from the bottom up (evolutionary and developmentally speaking)** – the downstairs (*reptilian brain*) maintains activities related to survival (breathing, heart rate, etc.); the downstairs (*limbic system*) perceives threat and monitors danger, generates emotions, including fear; monitors danger; defines pleasure and pain; activates fight or flight responses; makes hormones; and regulates immune function. The upstairs brain (*neocortex*) is largest in humans and is dedicated to rational thinking; perceives time; promotes organisation and goal setting.

Threat and stress



- **Threat can be perceived in a number of ways** – externally by neuroception and internally via your thinking process.
- **Neuroception** – awareness and sensing of the external environmental via the five senses; limbic system (downstairs brain) activates immediately, in response to neuroception; does not require conscious thought or decision-making.
- **Negative thinking** can activate the limbic system when we ruminate over past threats or worry about the potential of future threats.
- **The limbic system** subsequently activates a family of nerves (the **autonomic nervous system**) and the production of chemical messengers (**hormones**).
- **The autonomic nervous system** – divided into the accelerator (**sympathetic nerves**) and the break (**parasympathetic nerves**); also associated with *fight or flight* versus *rest & digest* responses.

Nerves, hormones and stress



- Sympathetic nerves produce the neurotransmitter **Adrenaline**; adrenaline is also made by cells of the adrenal glands – when produced by cells (as opposed by nerves), adrenaline is called a hormone.
- Adrenaline and other stress-related neurotransmitters can cause the following symptoms: *accelerated heart rate and breathing, high blood pressure, reduced appetite and digestion, reduced libido, enhanced glucose (sugar) release and increased energy production, dry mouth, sweating, and dilated pupils.*
- Adrenaline activates **the immune response**.
- **Cortisol** - a stress hormone (chemical messenger), production of which is initiated by the limbic system (downstairs brain); cortisol is also made in the adrenal glands; *the purpose of cortisol is to inhibit the immune response and act as part of a negative feedback loop to limit the stress response in the brain.*
- Stress occurring longer than 6 weeks is called **chronic stress**, which can cause damage in the body, if left unchecked.

Stress, the immune response & sickness behaviour



- Stress, in the form of **adrenaline and noradrenaline**, can activate the **anti-bacterial** part of the immune system, while simultaneously dialling down the **anti-viral** part.
- Immunologists believe that humans evolved to prime the immune response against bacterial infection in response to stress, as protection against bites from predators and cuts from infected environments.
- **What might this bias toward an antibacterial immune response (caused by stress) mean during a global pandemic?**
- **Sickness behaviour**, caused by the stress response, evolved to protect us from additional danger and allow us to heal and recuperate from injury and/or infection.
- Symptoms of sickness behaviour includes: isolation and anti-social behaviour, reduced appetite and libido, fatigue, apathy and disinterest, as well as and a need to sleep.
- 21st century-related stress can cause sickness behaviour in the absence of an infection or threat from wild animals.

The Gut Microbiome



- Over a trillion microorganisms including bacteria, viruses, fungi and yeast species live in the human gut that is called the gut microbiome
- The microorganisms are called probiotics
- Healthy whole food like fresh fruit, vegetables, whole grains, nuts and seeds contain fibre that probiotics like to eat – this food is called prebiotics
- Probiotics produce neurochemicals that can help balance our mood
- Therefore, there is a direct link between your mood and the food you eat

Summary



- It is important to realise that our minds can exert a physical effect on our bodies and vice-versa.
- Whole health contributes to happiness and involves the brain, mind, and body, interacting with our social and environmental worlds.
- Mind your thinking and manage stress!

References



SCIENTIFIC REVIEW:

Reciprocal regulation of the neural and innate immune systems. Irwin, M. Nature Reviews Immunology 11, 625–632 (2011).

ARTICLE:

How many cells in your body? National Geographic – Carl Zimmer – October 23, 2013.

BOOKS:

Why Zebras Don't Get Ulcers by Dr Robert M. Sapolsky. St. Martins Press; revised and updated edition (1 Jan. 2004).

The Psychobiotic Revolution: Mood, Food and the New Science of the Gut-Brain Connection by Scott C. Anderson, John F. Cryan, & Ted Dinan National Geographic (30 Nov. 2017).



Further exploration – videos/websites

Cellular landscape cross-section through a eukaryotic cell, by Evan Ingersoll & Gael

McGill.gaelmcgill.artstation.com/projects/Pm0JL1

***Why Zebras Don't Get Ulcers* by Dr Robert Sapolsky. Stanford University - Inaugural Fenton-Rhodes Lecture on Proactive Wellness**

www.youtube.com/watch?v=D9H9qTdserM

The Psychobiotic Revolution

<http://psychobiotic-revolution.com/>

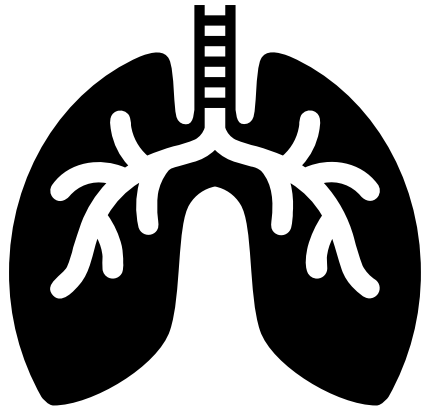
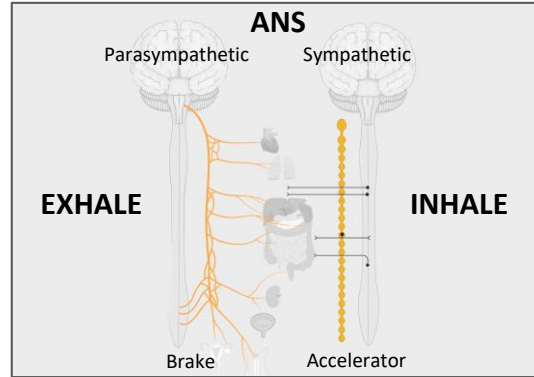


HOMEWORK

Breathe

Practice when you are waiting for the kettle to boil, the bus to come, etc.

Be aware of your breath and balance your inhalation with your exhalation



Breathe through your nose only!

- Breathe light (gentle)
- Breathe slow
- Breathe deep (into your belly)
- 5 seconds in; 5 seconds out

For anxiety and insomnia:

- 5 seconds in
- 5 seconds out
- Hold your breath for 5 seconds



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