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The Science of Health and Happiness

NOTES: LECTURE 2

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RCSI Science of Health and Happiness: NOTES LECTURE 2

The biology of mind-body connections

- 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.



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- **Threat can be perceived in a number of ways** – by neuroception and 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.



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- 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.



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- 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.



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The biology of mind-body connections

- 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!



Homework

Awesome Breathing (pacer for meditation and stress)
from the Apple App Store or Google Play

Alternatively for PC: xhalr.com

Practice breathing for 2 minutes, twice daily.

References

SCIENTIFIC REVIEW:

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

ARTICLE:

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

BOOK:

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

Further exploration – videos/websites

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

McGill.gaelmcgill.artstation.com/projects/PmoJL1

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

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