



**LC
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**London Centre for
Applied Psychology**

Neuroscience: The Basics

Section 1: The Brain



What you'll learn in this module

1

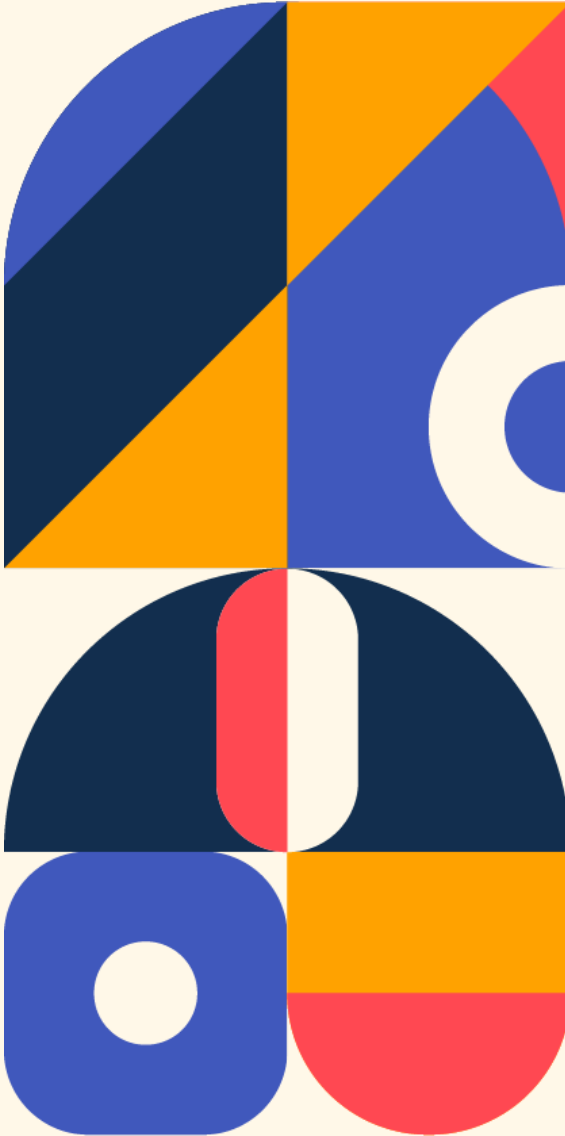
The Brain

The function of the brain
Brain basics
Myths about the brain

2

Clinical applications

Brain plasticity
Key themes – from impact of environment, childhood trauma – to Zoom fatigue
Specific difficulties and the brain – depression, anxiety, OCD
Habit formation and CBT



What you'll learn in this section

1

The Brain

The function of the brain

Brain basics

Myths about the brain

“The brain is a complex biological organ of great computational capability that constructs our sensory experiences, regulates our thoughts and emotions, and controls our actions.”

Eric Kandel

The brain - function

Why should we care? All mental processes derive from the brain. Likely evolutionary purpose – to keep our bodies alive. Allostasis.

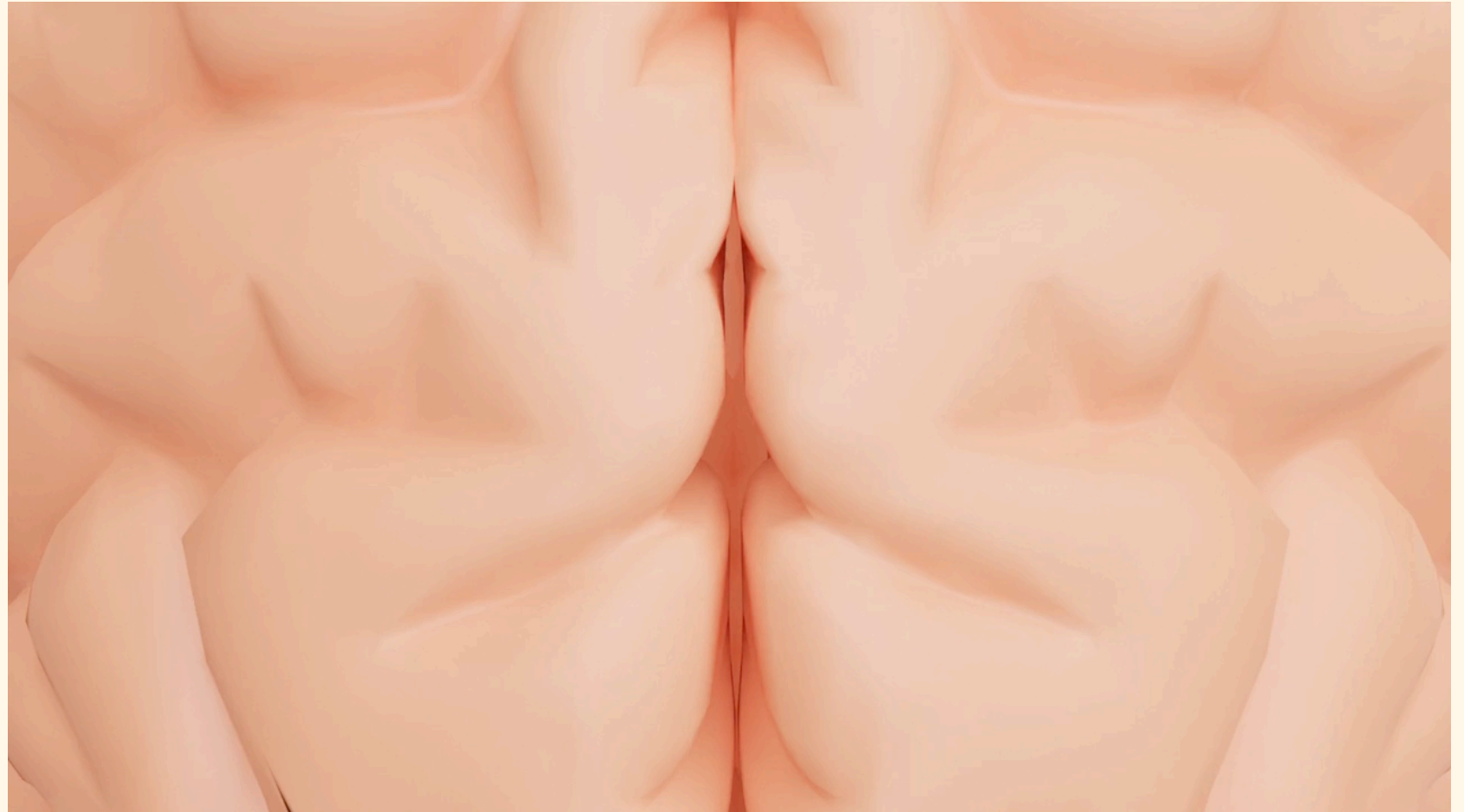
The brain is a soft mass of supportive tissues and nerves connected to the spinal cord. Highly folded to fit in the skull.

86 billion neurons, each of which forms average of 7000 connections with other neurons. 2% of body weight; 25% of energy.



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How the brain works

Creates experiences by making predictions based on previous information - “guessing”.

It's crucial to remember that **we often get those predictions wrong**. The foundations of mental distress - anxiety and depression.

Experience and culture shapes the brain. Infant brain is hungry for connections and learning.



Myth busting!

1. We have three brains and two systems.
2. The left brain and right brain are fundamentally different. Left brain equals rationality; right brain equals creativity.
3. It takes 21 days to build a new habit.
4. Meditation *literally* changes the brain.



The major parts

1. Brainstem

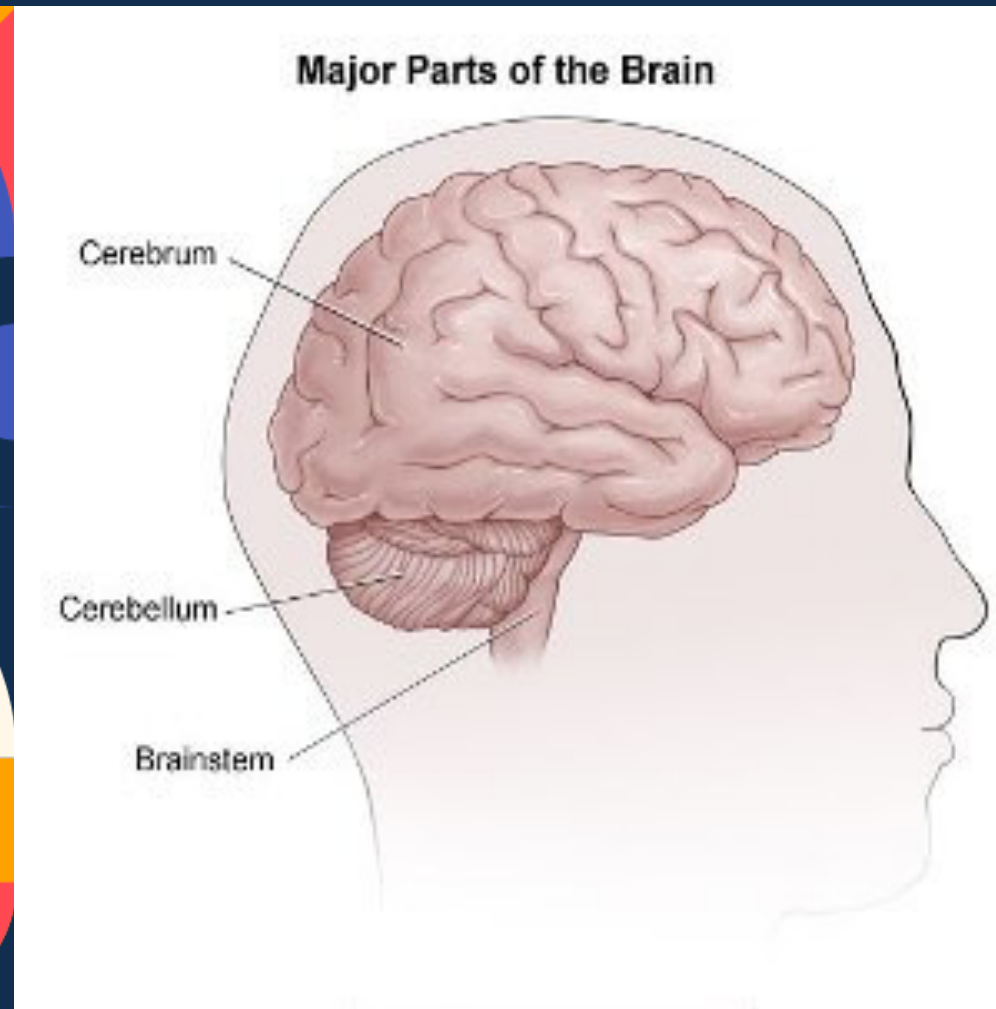
At the bottom of the brain, it connects the cerebrum with the spinal cord, and controls fundamental body functions such as breathing, eye movements and heartbeat.

2. Cerebellum

At the back of the brain, it controls balance and muscle coordination.

3. Cerebrum

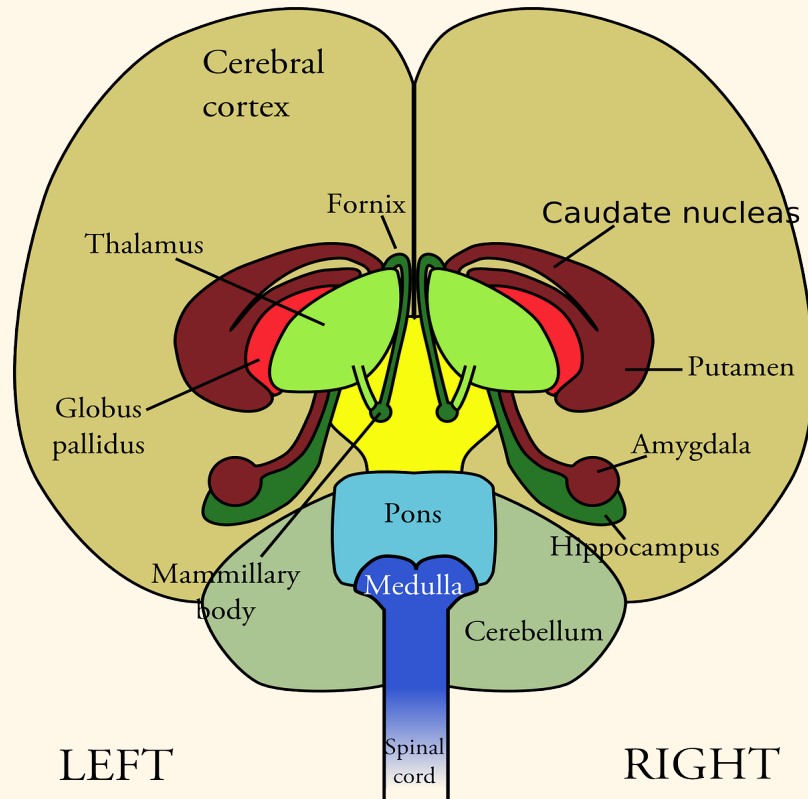
The large, outer part of the brain. Controls reading, thinking, learning, speech, emotions and planned muscle movements like walking.



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The inner brain

It determines our emotional state and modifies our perceptions and responses.

Hippocampus

Sends memories out to the appropriate part of the cerebral hemisphere for long-term coding and retrieving them when necessary (but not the same “memory”!).

Amygdala

Is involved with evaluating the environment and generating emotional responses to stimuli that are considered important. It also may be involved in the consolidation of memories that have some strong emotional component. Not just the “fear centre” of the brain!

Connections!

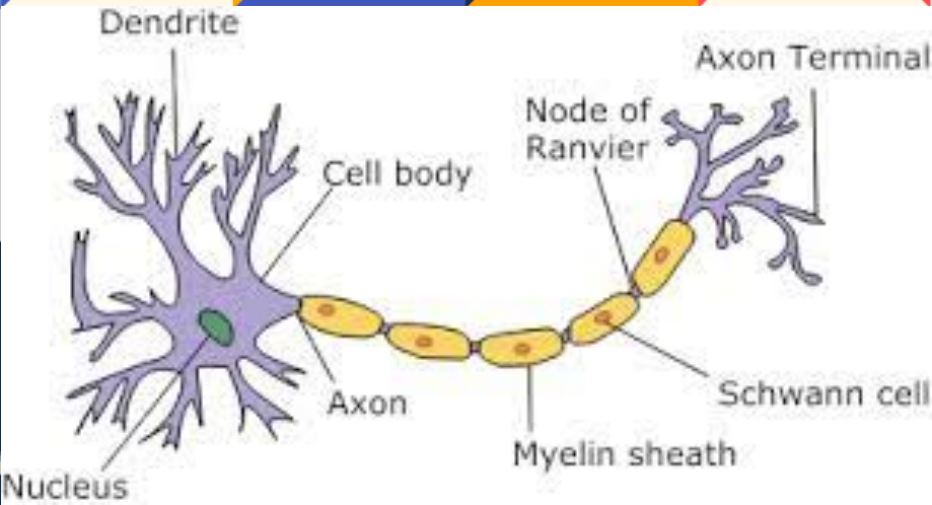
The primary functional unit is the neuron. All sensations, movements, thoughts, memories, and feelings come from neuronal signals.

Use it or lose it! Neuronal “pruning”. Or: “neurons that fire together, wire together”.

Learning: first time we do something it’s hard, but we build “pathways”.

Dendrites extend out from the cell body like the branches of a tree and receive messages from other nerve cells.

The electrical signal stimulates the release of **neurotransmitters** – chemical messengers – to the next cell, which can change its properties.



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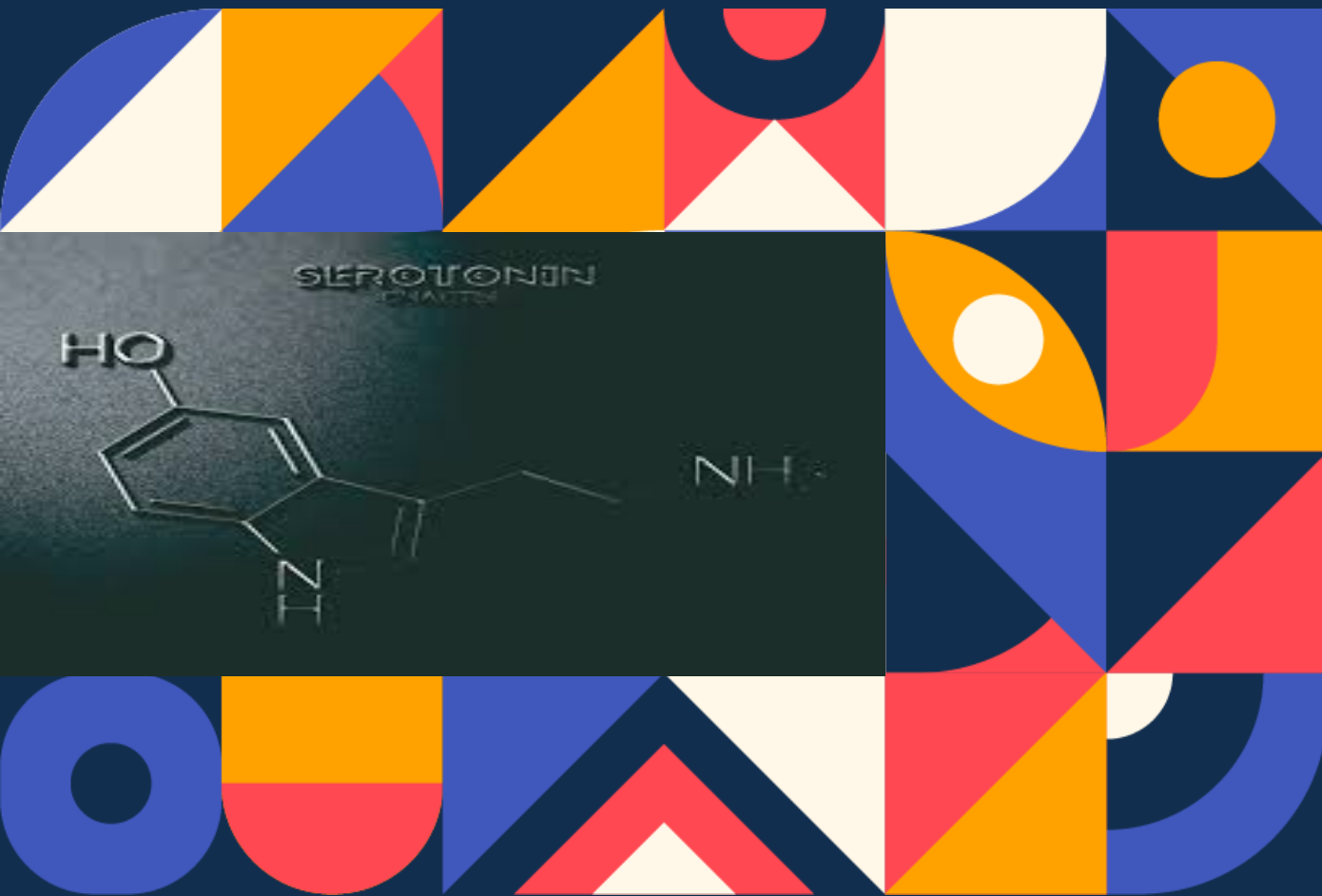


Connections!

The two most important (or talked about!) neurotransmitters in psychology

Serotonin constricts blood vessels and brings on sleep. It is also involved in temperature regulation. Low levels of serotonin may cause sleep problems and depression, while too much serotonin can lead to seizures.

Dopamine is inhibitory, and involved in mood and the control of complex movements. It plays a role in how we feel pleasure. It's a big part of our ability to think and plan. It helps us strive, focus, and find things interesting. Ritalin helps ADHD by boosting dopamine. Cocaine increases dopamine, boosting our natural reward system.



Does low serotonin cause depression?

Depression *may* occur when there is a suppression of new brain cells, a process which is likely mediated by serotonin.

There is no way to measure serotonin levels in the brain. Blood levels of serotonin have been shown to be lower in depressed patients, but we don't know if blood levels reflect the *brain's* serotonin levels.

We don't know *how* SSRIs help with depression.

Might depression *change* serotonin levels....?



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Key take-aways

1

We have one brain. Its primary purpose is allostasis. The brain works by making guesses/predictions based on past experience.

2

We learn new skills, new habits, new expectations by developing and cultivating neuronal pathways.

3

Mental distress is often the result of neuronal pathways developed over time that lead to incorrect or inaccurate predictions about the future. But they can be changed.



The next section

2

Clinical applications

Brain plasticity

Key themes – from impact of environment, childhood trauma – to Zoom fatigue

Specific difficulties and the brain – depression, anxiety, OCD

Habit formation and CBT