

The Nervous System

Collects, processes and responds to the environment & coordinates muscles and glands via neurotransmitters.

- Central Nervous System
- Peripheral Nervous System
 - **somatic** - voluntary / muscles
 - **autonomic** - involuntary
 - **sympathetic** - fight or flight
 - **parasympathetic** - rest and digest



Fight or Flight

Triggered by sympathetic NS, adrenaline released.

- Dilated pupils / digestion and bladder inhibited / increased heart rate / increased sweat.
- Increases blood flow to muscles, oxygen to brain.



The Endocrine System

Secretes hormones through blood vessels via glands via the blood stream.

- **Hypothalamus** - controls the pituitary gland.
- **Pituitary gland** - controls all other glands with its hormones.
- **Pineal gland** - melatonin / sleep
- **Thyroid** - Thyroxine / metabolism
- **Ovaries** - oestrogen / reproduction
- **Testes** - testosterone / reproduction
- **Adrenal** - adrenaline
- **Pancreas** - insulin/energy

Neurons

Chemical and electrical signals.

- **Sensory** - carry information towards the CAN.
- **Relay** - Found within the CNS, connect sensory and motor.
- **Motor** - Carry information away from the CNS to muscles/glands.
- **Receptors** - collect information from senses.
- **Effectors** - receive information (glands/muscles).
- They can only travel in one direction - binding / receptors / vesicles.

Plasticity

The brain develops new neuronal connections and physical changes throughout life.

Synaptic pruning - 'removes' unused connections.

Maguire - MRI scans of 16 right handed taxi drivers with 1.5y experience and compared to 50 non-taxi drivers. Found increased grey matter in the taxi drivers in the hippocampi.



Split-brain Research

Each hemisphere is responsible for a specific function. Left and right eye process information on the **Opposite** hemisphere.

- **Sperry** - 11 participants who had their corpus callosum removed.
- **Describe what you see** - Left hemisphere can describe, right cannot.
- **Tactile test** - Left hemisphere can describe and identify an item, right cannot describe but CAN identify.
- **Drawing task** - Left hemisphere draw poorly; Right hemisphere can draw clearly.

- ✓ Highly controlled and groundbreaking research.
- ✗ Epilepsy as a confounding variable / left vs right brain too simplistic- plasticity and a holistic view of brain may be more accurate.

Synaptic Transmission

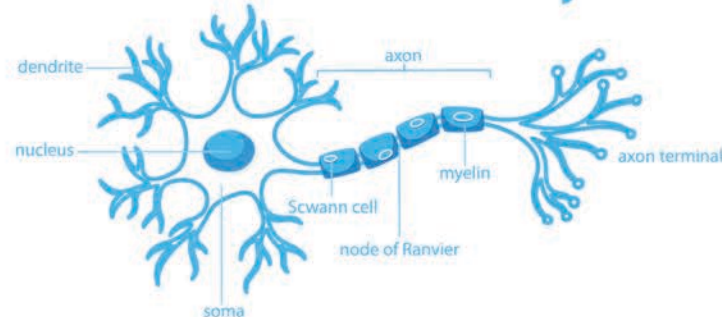
The movement of information from one neuron to the next.

Presynaptic membrane holds vesicles full of NT / electrical current encourages secretion across the synaptic cleft / binding on to the receptors of the post synaptic membrane.

Excitation - increases neuron firing, inhibition - decreases neuron firing.

Summation - the higher net value of excitatory / inhibitory neurons will fire.

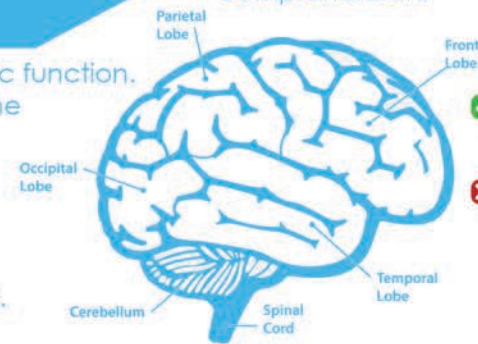
Neuron Anatomy



Localisation of Function

Specific areas of the brain have specific functions. Eg. Broca, Wernicke, Occipital lobe.

- **Frontal Lobe** - motor cortex / movement.
- **Parietal Lobe** - Somatosensory / senses.
- **Occipital Lobe** - Visual.
- **Temporal Lobe** - Auditory.
- **Broca's** - LEFT frontal lobe / speech production.
- **Wernicke's** - LEFT temporal lobe / language comprehension.



- ✓ Broca & Wernickes aphasia / fMRI scans.
- ✗ Biologically reductionist / gender differences. Contrast with plasticity as an alternative theory.

Functional Recovery

A form of plasticity where the brain compensates for damaged areas.

- **Neuronal unmasking** - dormant synapses 'unmask' and compensate.
- **Spontaneous recovery** - Natural recovery which slows down.
- **Axonal sprouting** - New nerve endings grow and connect to damaged nerves.

✓ Supporting research / the case of Gabby Giffords / real world application.

✗ Individual differences such as gender and the cognitive reserve.

Brain Scans

fMRI - Measures a change in energy released by haemoglobin in the brain. Low temporal resolution. High spatial resolution. Non-invasive but expensive.

EEG - Measures electrical activity on the scalp via electrodes. Provides a general picture of brain activity. High temporal resolution. Low spatial resolution. Non invasive and cheaper.

ERP - Measures brain activity via electrodes on the scalp when the participant performs a specific task. High temporal resolution. Low spatial resolution. Non invasive.

Post-mortem - structural examination after death. Detailed examination on humans rather than animals. Cause and effect. Time between death and post-mortem can be an issue.

Circadian Rhythms

24h cycle (sleep/wake).

- Primarily controlled by the SCN but needs light to reset each day.
- **Siffre case study** - Lived in a cave for 7 months and found that his free - running body clock increased to 25 hours.
- Shift work and jet lag - disruption to rhythms

✗ Individual differences - larks vs. owls, teenagers

Infradian Rhythms

A cycle longer than 24h (menstruation) FSH / Oestrogen / Progesterone all linked to the menstruation cycle.

✓ **McClintock** - pheromone study found that women who smelled the pheromones of other women altered the length of their cycle.

SAD - yearly rhythm which creates depressive-like symptoms during winter months.



Ultradian Rhythms

A cycle which repeated within 24h alternation between REM and non-REM.

5 stages of sleep which last about 90 minutes and repeat during 'sleep' frequency of REM increases during sleep.

✓ **Dement** - Found ppts who were woken during REM recorded dreaming whereas ppts woken during N-REM struggled to return to sleep.

✗ **Kleitman** - We live our entire sleep/wake cycle in periods of 90 minutes. And move from being alert to tired - BRAC.

Endogenous Pacemakers

Internal biological clocks - Suprachiasmatic nucleus - responds to light - melatonin releases melatonin which causes drowsiness/sleep.

✓ **Decoursey** - chipmunks had their SCN destroyed and returned to their habitat. All died.

✓ **Ralph** - bred mutant hamsters and adapted their cycles to 20 hours.

Exogenous Zeitgebers - external environmental cues. Light and social cues (meal times, activity).

✓ **Campbell** - light on the back of the knees wakes ppts.