BIOLOGICAL PSYCHOLOY

Week 1

Somatotopic mapping - mapping of spatial information in the body e.g. rats whiskers body → brain

Structure begets function

Brain has special functions/structures to protect it from its environment and damage:
Medically induced comas = protection of the nervous system, enables brain recovery

Ventricles: fluid filled spaces (filled with cerebral spinal fluid). Protection

Choroid plexus: barrier tissue of the CFS from the blood
Keep the brains environment protected and highly controlled

The blood brain barrier: helps to control the environment of the brain

Endothelial cells of capillaries are very tightly packed (more tightly packed than the rest of the body).

- The space between them allows nutrients etc. to pass through. The tight junctions prevent many molecules from passing across.
- Poses as a problem in drug discovery
- Some larger molecules e.g. glucose can get through due to active transport
- Bacteria is too big to get through (most of them)

Neurons are so tightly packed and their axons/dendrites so intertwined that looking at unprepared neural tissue reveals almost nothing about them

- Golgi stain: stains each neuron entirely black, making it possible to see individual neurons for the first time only in silhouette)
    - No indication of no. neurons in an area or the nature of their inner structure
- Nissel stain: uses dye that binds to cell bodies, thus can be used to estimate the number of cell bodies in an area
- Electron microscopy: provides details of neuronal structure. Images are so detailed that it can be difficult to visualise the general aspects of neuroanatomical structure

Anterograde neuroanatomical tracing methods: traces the path of axons projecting away from cell bodies located in a particular area

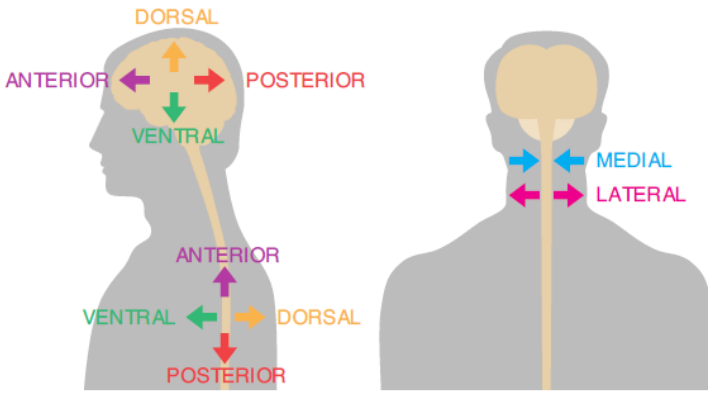
Retrograde tracing methods: traces the path of axons projecting into a particular area

Directions in the vertebrate nervous system

Directions described in relation to the orientation of the spinal cord

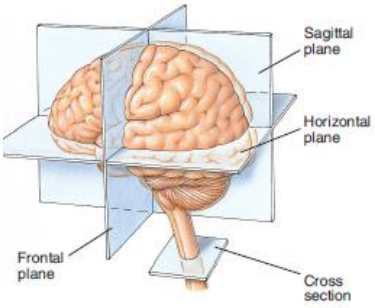
Anterior (rostral): towards the nose end. Sounds like 'nostril'

Posterior (caudal): towards the tail end



Dorsal: towards the surface of the back/top of the head. *Superior* in primates

Ventral: towards the surface of the chest/bottom of



the head

Medial: towards the midline of the body
Lateral: away from the midline toward the body's lateral surfaces

Frontal planes: vertical cuts – parallel to the face
Saggital sections: cut parallel to the side of the brain

Spinal cord
Gray matter: composed mainly of cell bodies and unmyelinated interneurons
White matter: myelinated axons

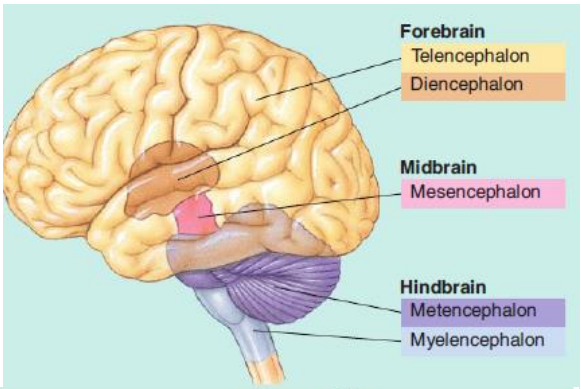
Pairs of spinal nerves attach to the spinal cord one on the left and one on the right side; axons join to the cord via the dorsal root or the ventral root

Dorsal root axons: sensory (afferent) unipolar neurons, cell bodies group to form the dorsal root ganglia

Ventral root axons: motor (efferent) multipolar neurons with their cell bodies in ventral horns

- Those that are part of the somatic nervous system: project to skeletal muscles
- Those that are part of the autonomic nervous system: project to ganglia, where they synapse onto neurons that in turn project to internal organs

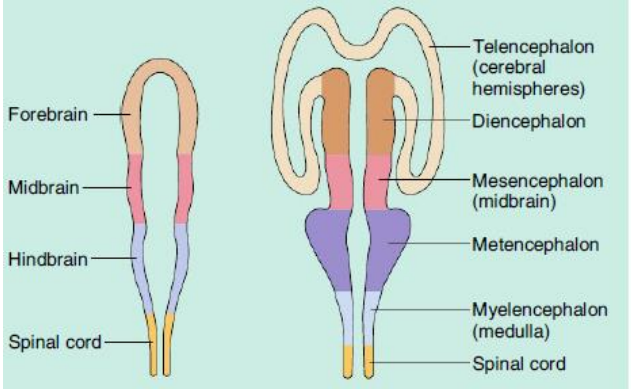
Five major divisions of the brain
Developing brain in the embryo:
Fluid filled tube → 3 swellings occur at the anterior end of this tube → become the adult forebrain, midbrain and hind brain
Before birth:
Forebrain swelling grows into → 2 swellings
Hindbrain → 2 swellings



From anterior to posterior the 5 swelling are:

- Telencephalon (cerebral hemispheres)
- Diencephalon
- Mesencephalon
- Metencephalon
- Myelencephalon (medulla)

Brain stem



Major structure of the brain
Myelencephalon (medulla) (hind brain):

- Most posterior
- Composed largely of tracts carrying signals between the rest of the brain and the body
- Contains the Reticular formation/RAS: role in arousal, also in sleep, attention, movement

Developmental psychology/ Developmental Science

Week 7

Focuses on research and theory in cognitive, personality and social developmental processes as well as physical changes throughout the lifespan (infancy, childhood, adolescence and adulthood)

Lifespan development: examines patterns of growth, change and stability in behaviour that occur throughout the entire life span
Looks at physical, cognitive, social and personality development

What affects development?

- *History-graded influences* aka Cohort effects: biological and environmental influences associated with a particular historical movement e.g. WWII, 9/11 attack
- *Age-graded influences:* biological and environmental influences that are similar for individuals in a particular age group, regardless of when or where they were raised
- *Socio-cultural graded influences*
- *Non-normative:* specific, a typical events that do not occur in most people's lives e.g. death of a 6 year olds parents

Pitfalls:
Typical vs atypical
Static vs dynamic
Nature vs nurture
Nativist approach: our DNA alone guides the development of cognitive and social processes and is innately driven

- Cyril Burt - argued intelligence was inherited. Faked his results

Empiricist approach: it's through our specific interactions with the environment that we develop cognitive and social processes

- John Locke - everyone born with a *tabula rasa* - 'blank slate'
- Watson - behaviourism. Albert and the rat - trained to fear
    - 'Albert' had a brain condition hence was not a 'typically developing' infant

Core goal of twin research: is to estimate the heritability of traits - what *percentage of variance* in the population is due to genes and what's due to the environment e.g. schizophrenia, bipolar

- Environmental constraints hinder conclusions from twin research - same environment can never produce twins that are truly identical
- Cyril Burt - argued intelligence was inherited. Faked his results

Epigenetics: heritable changes in gene expression that are not caused by changes in DNA sequence but by positive or negative early life experiences

- Our experiences can create a genetic memory without changing the sequence of DNA inherited from out parents. This genetic memory can help build optimal brain development
    - Early environmental experiences e.g. a mothers care or lack of it, can induce chemical changes on the DNA...altering gene expression without changing the underlying DNA sequence
- Attempts to encapsulate the impact of both genes and environmental factors and their combined role in development

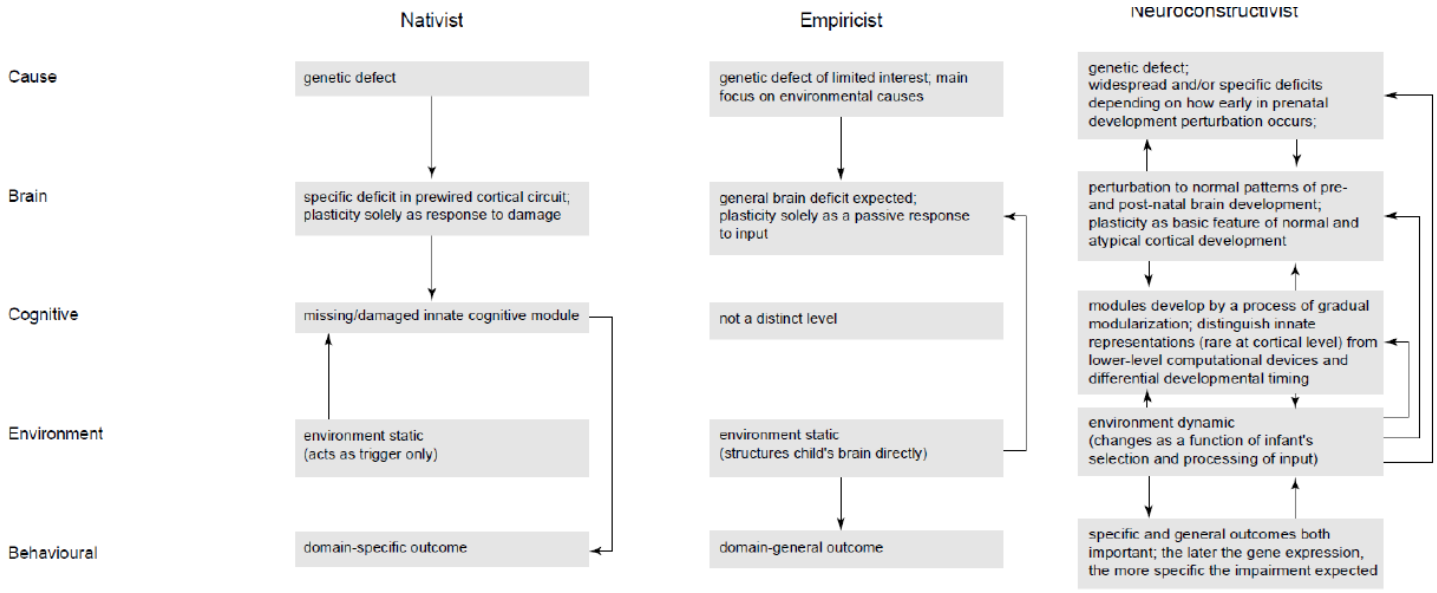
Continuity vs. Discontinuity
Continuous change: gradual development, achievements at one level building on those of previous levels. Quantitative. Matter of degree, not of kind

Discontinuous change: change occurs in distinct stages. Behaviour and processes are qualitatively different at different stages

Modularity: mind is composed of independent, closed, domain-specific processing modules.

Neuroconstructicism: developed by Annette Karmiloff-Smith

- Looks at the interplay of gene, cognition and environment.
- Not dynamic but static
- Modules develop as a process of graduate modularisation
- Infant brain is highly interconnected and there is gradual modularization across development
- Modules are not innately specified in the infant brain



Piaget: development occurs in discrete stages in which knowledge progresses through a progressive sequence (schemas) that adapt and change as the infant becomes more advanced in their motor capabilities

- skills in one stage need to be acquired before moving onto the next stage
- Argued that intellectual development (knowledge) governed all other aspects of development (social, personality, motor etc.)