Divisions of Nervous System

CNS (brain and spinal cord)

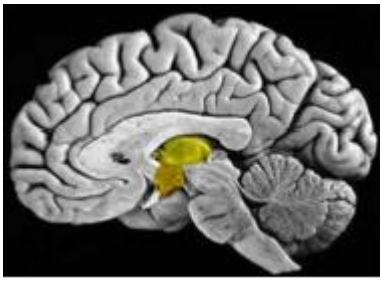
The Brain is protected by:

(a) Bone
(b) Meninges
- Membrane with blood vessels
- Supply blood to the brain
- Flexible sheet, made from 3 membranes between bone and nervous tissue
  1. Dura mater – thick, hard, strong outer membrane providing physical protection
  2. Arachnoid membrane – web-like appearance, spongy, shock absorbing, contain blood vessels
  3. Pia mater – thin, follow all the creases and folds in the brain

(c) Blood brain barrier
- Functional form of protection
- Blood vessels supplying blood to CNS have special walls with smaller pores restricting entry of many chemicals into CNS
- Heroin is a more potent opiate than morphine because heroin more readily crosses b.b. barrier (once inside, converts in morphine)
- E.g. anti-histamines → drowsy if in brain therefore does not have effect on brain if it cannot cross the blood brain barrier

- Nervous tissue is fragile therefore must be well protected
- Brain requires high blood supply (2% of body weight, 15% of blood and 25% oxygen used by the brain)
- Ventricles (cavities) filled with cerebral spinal fluid (CSF) which is the same fluid in arachnoid membrane (meninges)
- Sewerage system of CNS: blockage causes hydrocephalus (inflates ventricles, squashing brain) which has –ve effect on the functions of the brain e.g. nausea

1. Brainstem:
   - Damage to the brainstem following head injury leads to coma and death (increase in intracranial pressure squashes brainstem)
   - To relieve pressure, may drill smaller hole in the stem
   - The pressure from bleeding → travels towards foramen magnum where brainstem is (where it becomes spinal cord)
2. Cerebellum:
   - Control of precision movements (including learned skills such as talking)
   - Densely packed with neurons
   - >50% of neurons in the brain
   - 10% of the brain mass
   - Stroke = blood flow to brain is compromised in some way e.g. through blood clot; brain tissue will lose blood supply and will deteriorate irreversibly
3. Thalamus and hypothalamus (on top of the brain stem)
   - Thalamus (above) relay station for sensory info coming from the rest of the body
   - Hypothalamus (below)



    - Pituitary gland (below hypothalamus) – control of other glands and hormone regulation
4. Limbic system (wrapping around the thalamus)
    - Involved in control of emotions and memory
    - Emotional experiences are more memorable
5. Basal ganglia (wrapping around the thalamus)
    - Involved in action and thought
    - General selection of the most appropriate action to be made at a certain time
6. Neocortex (convoluted sheet on top of brain)
7. Corpus Callosum
    - Collection of "cables" connecting two hemispheres allowing communication

    - Brain size, brain : body ratio does not determine intelligence
    - Sex and brain size do not correlate (on *average*, men have larger brains)

The spinal cord:

- directly connects the brain to PNS
- a cable of neural fibres

The cortex

- the thickness of the cortex is fixed (made up of 6 layers of neurons), by folding it on itself, the cortex can increase its total surface area
- increases in size across mammals (more than any other brain area)

The Four Lobes

- Frontal (planning and executive functions) – the back is involved with motor control
- Parietal (understanding space and how to move in it) – front is involved with touch
- Temporal (memory and language) – top is involved with hearing
- Occipital (vision) – humans are very good at recognising and distinguishing objects in our environment visually
- Middle of the brain involved with taste and smell

PNS (sensory nerves, motor nerves, Autonomic Nervous system)

- Sensory (afferent): from sensory organs to sensory organs (eye, ear, vestibular apparatus, nose, tongue, skin)
- Motor (efferent): from CNS to muscles
- Autonomic Nervous System (controlled by brain)
    - Controls many non-voluntary bodily functions (e.g. digestion, heart rate, blood pressure, sweating, pupil size, genitals)
    - *Sympathetic* prepares for action e.g. increase heart rate
    - *Parasympathetic* involved in rest and recuperation e.g. decreased heart rate