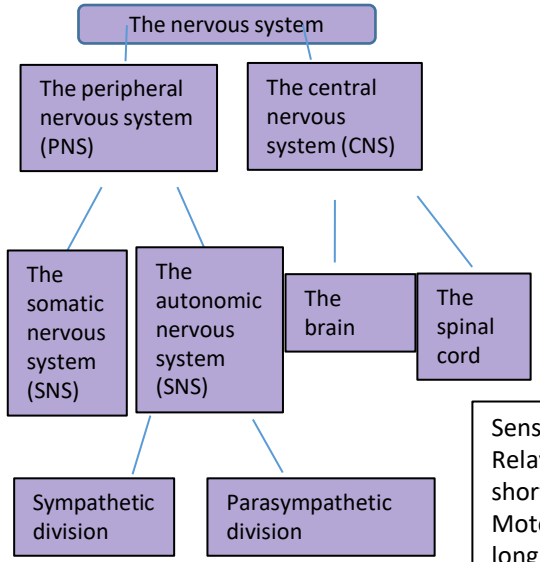
Psychology: Chapter 7- Brain and Neuropsychology | Year 11 | January - April

The nervous system
A network of cells in the human body and the main communication system.
Roles;
Collect and respond to information in the environment
Control the different organs in the body including the brain.



Electric transmission- how neurons fire
Resting state; negative charge.
When firing, the charge inside the cell changes which creates an action potential.

Sensory – from PNS to CNS, long dendrite, short axon,
Relay – connect sensory to motor. Short dendrite, short axon.
Motor: from CNS to muscles/glands. Short dendrite, long axon.

Synapses and chemical transmission
The synapse – where neurons communicate with each other: terminal button at presynaptic neuron + synaptic cleft + receptor sites on postsynaptic neuron.
Release of neurotransmitter – electric signal causes vesicles (in presynaptic terminal button) to release neurotransmitter into synaptic cleft.
Reuptake of neurotransmitter: Neurotransmitter in synaptic cleft attaches to postsynaptic receptor sites. Chemical message turns into electrical impulse.
Remaining neurotransmitter reabsorbed.
Excitation and inhibition: Excitatory neurotransmitter increase postsynaptic neuron's charge, more likely to fire. Inhibitory neurotransmitter increases negative charge, less likely to fire.
Summation: More, excitatory than inhibitory signals mean that neuron fires, creating an electrical impulse.

Functions of the NS
Central NS
Made up of brain and spinal cord.
Hemispheres in brain – each control opposite side of body.
Brain – conscious awareness
Brain stem controls basic functions and autonomic functions. Connects to spinal cord.
Peripheral NS – information from outside to CNS.
From CNS to muscles
Autonomic nervous system
Automatic functions e.g. breathing, heart rate, stress response.
Somatic nervous system
Voluntary movement of muscles and reflex responses.
Sends messages to muscles and takes in information from sensory organs.

Structure
Cell body: nucleus containing DNA
Axon: carries signals, covered in myelin sheath which helps and protects.
Myelin sheath: fatty covering of axon with gaps (nodes and Ranvier), insulation and speeds, signal.
Terminal button: End of axon, part of synapse.

Hebb's theory of learning and neuronal growth- KEY THEORY
Brain is plastic –synaptic connections become stronger more they are used. Brain can change and develop.
Brain adapts- changes in responses to new experiences at any age.
Learning leaves a **trace called an engram**, if learning is rehearsed this can be permanent.
During learning cell assemblies (groups of neurons) fire together, more times this happens synaptic connections become stronger and the groups of neurons effectively grow to manage new learning. **'CELLS THAT FIRE TOGETHER, WIRE TOGETHER'**
+ scientific theory
+ real word application to education
- Reductionist – neuronal level

Autonomic nervous system (ANS)
Actions of ANS cannot be brought under control. Actions happen without us having to do anything. E.g. our heart beating.
Two divisions sympathetic & parasympathetic work in opposition of each other. Sympathetic represents state of arousal preparing body for fight or flight to deal with stress.
Parasympathetic counteracts actions of sympathetic to normal resting state.

Fight and flight response
A number of physiological changes to prepare the body for action – either fight or run away from danger.
Hypothalamus identifies threat and triggers the sympathetic division of ANS
Release adrenaline the stress hormone into bloodstream. Physiological changes due to adrenaline increase heart and breathing rate, dilated pupils, inhibits digestions and saliva production.
After threat passes parasympathetic division takes over and puts body into rest and digest.

James Lange theory of emotion- KEY THEORY.

EVENT>AROUSAL>INTERPRETATION>EMOTION

Explanation of emotion, brain interprets physiological changes as an emotion after the physical change occurs first e.g. fear, excitement.
No physical changes = no emotion e.g. heart beat not any faster when presenting in front of class means not nervous or fearful.
+ phobias provide evidence for emotion after arousal
- Cannon-Bard theory contradicts some emotions occur at same time.
- Simplistic – need social cues to label emotions

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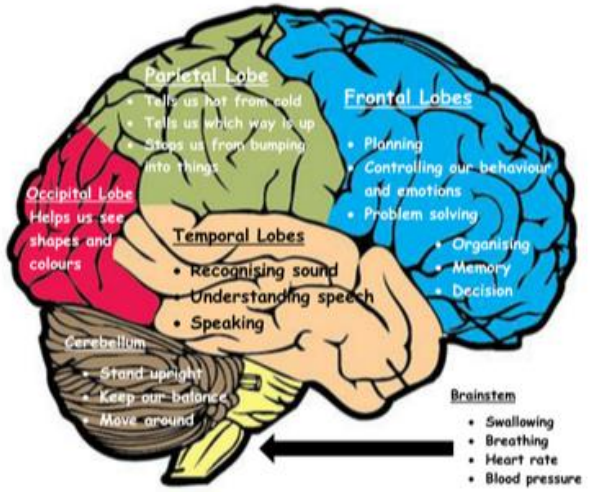
Localisation of function – specific areas do particular jobs.
Motor area – damage to left hemisphere affects right side of the body and vice versa. Somatosensory – less ability to feel pain, sensitive body parts take up most space. Visual LH damage – problems with right visual field.
Language – Broca's area – speech production – damage = difficulty remembering/forming words. Wernicke's area understanding speech, difficulty producing meaningful speech if damaged.

Frontal lobe contains motor area – at front of brain, controls thinking, planning and movement.
Parietal lobe – contains somatosensory area Behind frontal lobe, processes sensations.
Occipital lobe, contains visual area. At back of brain controls vision.
Temporal lobe, contains auditory/language area. Behind frontal and below parietal lobe. Speech and language.
Cerebellum receives information from spinal cord and brain. Coordinates movement and balance.

Penfield's study of interpretive cortex- KEY STUDY
Aim: investigate function of temporal lobe
Method: epilepsy patients operated on using Montreal procedure.
Results: temporal stimulation – experiences & interpretation
Conclusion: area of brain called interpretive cortex stores personal meaning of previous events.
+ Precise method
– Mixed results in later research
- Cannot generalise sample to people without epilepsy



Neuropsychology – the scientific study of the influence of brain structures on mental processes.
e.g. different memories are in different areas of the brain.
Neurological damage –effects of stroke, damage to motor ability – problems with fine movements.

Scanning techniques
CT: large doughnut shaped scanner, lots of Xr-ays of brain combined to give big picture
(+) higher quality (-) High level of radiation
PET – patient injected with radioactive glucose. Brain activity shown on computer screen.
(+)show brain in action (-) Expensive
fMRI – measures changes in blood oxygen levels. Displayed as 3-D image.
(+) produces clear image without use of radiation
(-) expensive and have to stay still

Tulvings gold memory study- KEY STUDY
Aim: investigate if episodic memories produce different blood flow patterns to semantic ones.
Method: 6 pps injected with radioactive gold. Used PET scan on episodic and semantic memory trials.
Results: semantic memories in posterior cortex, episodic in frontal lobe.
Conclusion: memory has a biological basis and is localised.
+ Objective evidence from brain scans (factual and scientific)
- Sample small
- Difficult to separate memories