Central Nervous System

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brain and spinal cord!

- central processing and control point for all human behaviour

Brain:

- processes incoming info from all senses
- responsible for controlling behaviour

Spinal Cord:

- connects brain to rest of body
- allows messages to be passed body → brain
  brain → body

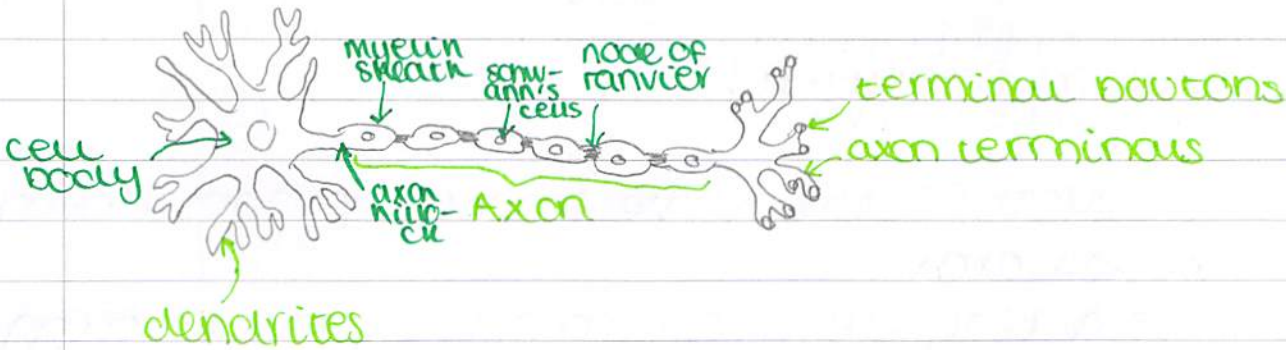
in order to obtain a response.

Neurons:

- cells within the CNS
- communicate with lots of other cells in huge networks

Neurons

- we focus on motor neurons!



Cell Body:

- contains nucleus → houses genetic material
  mitochondria → provides energy

Dendrites:

- attached to cell body
- receives messages from other neurons
  ↳ trigger an action potential within the cell

Axon:

- passes electrical impulse towards the axon terminals
- axon hillock attaches axon to cell body + is where the nerve impulse is triggered from
- outside of axon there are fatty deposits → myelin sheath → insulating layer to speed up rate of transmission
- breaks between cells along the myelin sheath
  ↳ nodes of ranvier

Axon Terminals:

- pass nerve impulses from cell body to the parts of the body they can't control/activate
- terminal boutons at the end

- Bulb shaped structures → vesicles → store neurotransmitters for synaptic transmission.

Action Potential:

- the METHOD the nerve impulse passes down the ~~neuron~~ axon
- its a tiny electrical impulse that is triggered by a change in the electrical 'potential' of the neuron

Resting Membrane Potential:
- Slight negative charge (in relation to outside of the neuron)

When neuron receives a message from another it either stimulates:
- excitatory postsynaptic potential
  - ↳ depolarise neuron
  - ↳ reducing charge
- inhibitory postsynaptic potential
  - ↳ hyperpolarise neuron
  - ↳ increasing charge

When it has received more excitatory than inhibitory an action potential is triggered

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sends impulse along the axon of the neuron.

Synaptic Transmission

When the electrical message reaches the terminal button it turns into a chemical message

Neuron can then pass its message to other neurons across the synaptic gap (the space between 2 adjacent neurons)

Each neuron is responsible for producing a certain neurotransmitter/chemical

Action potential reaches axon terminal
- ↳ calcium channels open
  - ↳ floods terminal button w/ calcium ions
    - ↳ vesicles will be released
      - ↳ travel to outer membrane of TB
        - ↳ casing of vesicle fuse w/ membrane
          - ↳ neurotransmitter released

Receptors on postsynaptic neuron are designed to bind to a specific neurotransmitter - once detected it will be absorbed

unabsorbed molecules left in the synaptic gap will be destroyed by enzymes

OR

will be absorbed by the presynaptic neuron (reuptake)
(they will then be destroyed by enzymes WITHIN the neuron)

Neurotransmitters:

Dopamine

- related to emotion + cognitive function
- posture + control of movement
- reinforcement in learning
- dependency (eg. addiction)
- hormonal regulation

Serotonin

- mood control (esp. in limbic system)
- pain - regulating body temperature
- sleep - hunger

Acetylcholine

- stimulates muscle contractions
- necessary for memory + other cognitive functions
- involved in expression of some emotions (eg. anger and sexuality)

Recreational Drugs and the CNS

known as psychoactive drugs as they alter brain function.

taken for personal enjoyment

Reward Pathway:

- when activated gives a pleasant + rewarding feeling
- feeling encourages us to repeat behaviour
  ↳ key component in learning
- can have adaptive function (high calorie food activates so ensures we have enough fat stored)
- drugs hijack the system → produce feeling w/o adaptive function

Drugs act by changing the way neurotransmitters work in the brain.
Most drugs work on the dopamine system.
↓
Heroin increases dopamine in the nucleus accumbens and ventral tegmental (areas of reward pathways)

BUT brain reacts to sudden increase of dopamine and reduces natural production so when the drug wears off they have less dopamine than normal → causes them to take the drug

Repeated drug use causes even less dopamine making person physically dependent on drug

Drugs MIMIC neurotransmitters

Nicotine:

- targets parts of the dopamine pathway
  ↳ increases amount + transmission of dopamine by blocking enzyme that breaks it down
- mimics acetylcholine
- binds to nicotic receptor

Cocaine:

- increases activity in dopamine pathways
  ↳ blocks reuptake of dopamine

How do these processes lead to addiction?

- withdrawl occurs when drug is no longer active in our nervous system
- Brain adapts to the changes caused by the drug so no longer operates normally w/o the drug.

Can also lead to tolerance

- user has to take BIGGER doses of the drug to get the same effect as before (due to down regulation).

Brain Structure and Aggression

History:

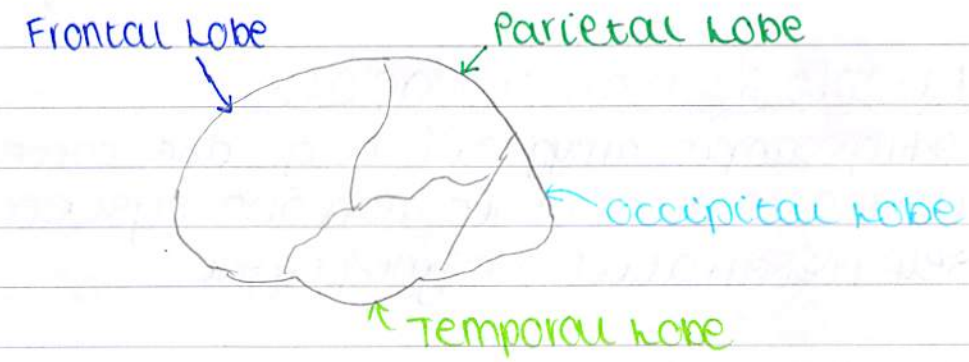
- Trepanning - migraines and epilepsy
- Hippocrates → each hemisphere has a diff function
- Phrenology - character by mapping bumps on head
  BUT shows behaviour linked to brain
- Phineas Gage

Case studies of brain damaged people allowed physicians to start mapping the brain

Paul Broca - patient only said 'tan'
- area damaged → Broca's Area
  motor control for speech production
- understand speech but can't respond

Carl Wernicke – Wernicke's Area
involved in understanding speech
- patients can produce speech but can't comprehend it (Wernicke's Aphasia)

Nowadays can use neuroimaging techniques instead of lesion studies.



Aggression:

Types:

- Person-oriented → harm to person
- Instrumental → obtain reward/outcome
- Reactive → response to being provoked
- Sanctioned → legal/permitted

Animal Types: (can't have intention)

- Offensive - attack another animal
- Defensive - response to threat or attack
- Predatory - attack to gain food

Hypothalamus:

Lesion/Stimulation of ... causes ... in cats

- medial hypothalamus → ~~aggression~~ offensive
- dorsal hypothalamus → defensive
- lateral hypothalamus → predatory

Pre-frontal Cortex:

- regulates emotions
  ↳ lack of regulation = aggression

evidence:

- people with ADHD have low activity
- Raine murderers have low activity

Limbic System / Amygdala:

↳ hippocampus, amygdala, cingulate cortex + more

- linked to autonomic nervous system
- self preservation → fight/flight

Amygdala:

- centre for emotions, motivation + emotional behaviour

- integrates internal + external stimuli from every sensory modality
- gives instinctive feeling
- connected to PFC

evidence:

→ when amygdala removed from rhesus monkeys there was a taming effect

- Narabyashi studied ps with removed amygdala, reduced agression in 43/51
- Koeing studied 40 prisoners (20 psycho, 20 not) - there was structural + functional differences
  ↳ lack of communication between PFC and A means psychopaths can't regulate social + emotional behaviour

Evolution and Aggression

What is it?

- gradual development of diff kinds of living organism
- happens by natural selection
  - organisms better adapted reproduce more, passing on genes
- variation is due to mutation
- evolutionary psychologists argue that the mind evolves like the body (and therefore behaviour)

Behaviour:

- brain built due to inherited genes
- structure + function of brains have evolved to serve an adaptive function in the EEA
- look at fossils then try to match believed 'adaptive' behaviour to modern day behaviour
- can explain mate choice, parental investment etc.
- environment has changed - left with hardwired info that can clash with our modern environment → obesity!

Aggression:

- in EEA bigger + stronger males → more capable of providing food and protecting family
- males who were more aggressive when resources threatened or hunted - have adaptive advantage

↓

advantage in mate choice - females want mates w/ good genes (big + strong)

- females less physically aggressive as an evolutionary disadvantage - would put them + their children at risk
- Buss → females more verbal, chose mates by

delegating other females to worse men

If valid ideas...

- difference in structure/chemistry in brains of M/F
  ↓
  greater expression of aggression in males

Evaluation:

✓ • M brains have minor differences to F
  linked to spatial awareness ↑ aggression
  ↓
  adaptive advantage in EEA

X • 'post-hoc' argument → theory developed to fit facts

X • can't prove as can't be scientifically tested + limited fossil records for behaviour

• can explain but can't be tested as can't access EEA

Freud's Psychodynamic Explanation

↓

activemind

2 innate drives - motivation for all human behaviour

- Eros → life instinct (aka libido)
- Thanatos → death instinct

* Have to balance each other out

Human behaviour is interaction of 2 forces

Thanatos is primarily directed at ourselves but as a result of the interaction its redirected to others in the form of aggression.
BUT we're not always aggressive due to catharsis

↓

satisfying urges w/o violence by watching violence or partaking in minor violence (video games / sports)

Parts of personality:

id

- made up of the 2 drives
- have from birth until around 2yo
- * pleasure principle
- demanding (urges to be satisfied)

ego

- appears around 2yo
- * reality principle
- urges of id controlled + delayed
- norms + rules of society learned

superego
- emerges between 3yo - 6yo
* - morality principle
- develops understanding of right and wrong
- pride/guilt
- aggressive urges should be well controlled

The conscious and unconscious:
- Freud wanted to target the unconscious which contains hidden aspects of yourself
* MUST SEE ICEBERG IN TEXTBOOK *

Comparing psychodynamic and biological:
Lots of scientific evidence for biological BUT a distinct lack of evidence for pd.

Easy to ~~test~~ scientifically test biological as data (of bio + behaviour) is objective BUT it is impossible to see Freud's ideas
↓
Most scientific studies of pd CONTRADICT Freud
↓
Bushman - ppl that engaged in catharsis were more aggressive than those that did nothing

Bio - objective as can be seen/measured
Pd - concepts are subjective

Hormones and Aggression

Hormones

- chemical ~~trans~~ messengers in blood that operate over whole body
- take longer to work than neurotransmitters
- produced and excreted by glands
  ↓
  endocrine system - autonomic NS

Hormones affect behaviour + cause physical changes
↳ oxytocin increases trust

Testosterone is an androgen → develops/maintains male characteristics

Antenatal exposure:
- organising effect on developing brain
- increased spatial ability
- competitive aggression

There is a critical period after birth when testosterone 'sensitises' certain neural circuits
↓
stimulates cell growth in hypothalamus + amygdala
(brain struc. + aggression)

Evidence:
- castrated male rodents → little/no aggressive behaviour but if test. injected back show typical aggressive behaviour
- there is a different effect dependent on AGE
  newborn - injections have no effect
  10 days + - injections bring back normal levels

- Young et al (1959) injected pregnant monkeys w/ testosterone – offspring (m+f) were more aggressive
↓
links to antenatal period.

Testosterone also influences aggressive behaviour by effecting changes in neurotransmission

Human studies:
- Mazur (1983) – test. levels increase in early teens and there is a strong +ive correlation w/ aggressive behaviour + inter-male fighting
- Dabbs (1988) – looked @ female prisoners + test. was higher in cases of unprovoked violence + lowest where aggression was defensive.

*correlation doesn't show cause + effect *

Evaluation:
- cause/effect: does test. cause aggr. or aggr. cause test.?
- reciprocal model of test. suggests that test. is an EFFECT of dominance
- Mazur + Booth found test. dependent on environ. status
- Studies on mammals: – limits generalisability brain areas affected by test. serve diff functions in diff species
- experiments can't be ethically carried out on humans
↳ criminals are not representative of population (castrated)