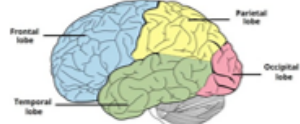


LOCALISATION OF FUNCTIONS OF THE BRAIN

- Specific areas of brain associated with particular function = cortical specialisation
- Lateralisation = functions dominated by a hemisphere
 - Right hand action → left hemisphere
- Outer layer cerebral cortex more developed in humans

- a) Motor area = controls voluntary movement on opposite side of body
- b) Somatosensory area = sensory info from skin
- c) Visual cortex = visual field info from eye to opposite cortex
- d) Auditory area = analyses speech based info, language comprehension

- 1) Broca's area = speech production
Broca aphasia = laborious, non fluent language
- 2) Wernicke's area = language comprehension
Wernicke's aphasia = nonsense words (neologism)



+ brain scan → Broca area active during reading task → scientific evidence
- Plasticity → brain adapts when function lost → not localised

- Neurosurgical evidence → epilepsy surgery → suggests mental illness localised

- Reductionist → higher cognitive functions holistic → learning too complex to be localised
+ Lashley's study on rats → cant generalise

NERVOUS SYSYTEM & ENDOCRINE SYSTEM

- Nervous system communicates on electrical and chemical signals
- CNS – conscious awareness
 - 2 hemispheres
 - spinal cord messaging
- PNS – transmits messages via neurons
 - ANS – autonomic
 - vital body functions
 - SNS – somatic
 - muscle movement

- Endocrine system controls vital functions slower-powerfully
- Glands secrete hormones into blood
 - Thyroid → thyroxine (increases HR) and affects growth rate
 - Adrenal → adrenaline (fight or flight)

- Hypothalamus activates gland
- ANS changes from parasympathetic to sympathetic
- Immediate autonomic response
- Parasympathetic returns body to resting state

NEURONS & SYNAPTIC TRANSMISSION

- Nucleus in cell body (DNA)
- Dendrites carry impulses away
- Axon carries impulses away
 - Myelin sheath is fatty layer which increases speed of transmission
- Nodes of Ranvier
 - Transmission jumps along axon

Sensory neurons in PNS as ganglia
Relay neurons (97%) in brain & visuals

Neuron activated by stimulus and inside becomes less negative/more positive causing action potential as impulse

- Neurons communicate as neural networks separated by synapse
- Electrical impulse reaches presynaptic terminal triggering release of neurotransmitter from synaptic vesicles
- Taken up by post synaptic receptor site on dendrites
- Each neurotransmitter has specific molecular structure fitting perfectly into post synaptic receptor site
- Serotonin causes inhibition in receiving neuron as it's more negatively charged so less likely to fire
- Adrenaline causes excitation of postsynaptic neuron increasing positive charge so more likely to fire

If net effect is inhibitory/excitatory that that's result = summation

BIO – CIRCADIAN RHYTHMS

: 24hr cycle regulating processes such as sleep/wake cycle and core body temp
Endogenous pacemakers: internal body clock to regulate rhythm (superchiasmatic)
Exogenous zeitgebers: external factors in environment that reset body clocks (sunlight, social cues)

Siffre – Cave study

- 2 mnths in isolation in subterranean cave + 6 mnths in Texan cave
- Sleep/wake cycle of 25-30hrs
- No triggers, regulated by self
- Endogenous pacemakers exert influence on circadian rhythms

Aschoff & Wever - bunker

- sleep/wake cycle of 25-27hrs
- 4 weeks with no natural light
- Endogenous pacemakers control in absence of light cues

Folkard – cave

- 12 ppt, no light, 3 weeks
- Changed clock so only 22hrs passed per day
- No ppt could adjust showing strength of circadian rhythm

+ practical application → shift workers health and concentration → economic implications
- Consistent shift work → night shift causes health issues and is most difficult too

+ drug treatments → take at peak times so effective → developed guidelines and improved treatments

- Extraneous variables → age, health, dosage → non conclusive

- Small samples → prevents general conclusions → non generalisable

+ evidence of sleep/wake cycle → endogenous pacemakers exerts influence on rhythm

SPLIT BRAIN & LATERALISATION

: hemispheres are functionally different and processes dominated by one not both

Sperry 1968 → split brain research

- Patients undergo commissurotomy to split hemispheres to control seizures
- Natural experiment (IV already occurred)

Procedure

- 11 patients
- Image/word projected onto right visual field processed by left hemisphere (vice versa)
- Info not conveyed between hemispheres

Sight

- Pic shown to right visual field – patients described it
- Shown to left v.f – couldn't describe pic
- Language processed by left hemisphere

Touch

- Left hand able to select object most closely related to object in left v.f
- Even tho couldn't verbally describe

Words

- 2 words simultaneously on both v.f
- Writes with left hand on left side
- Reads on write v.f

Faces

- Right hemisphere dominant
- Pic processed by right hemisphere and ignored pic shown to left hemisphere
- Left hem. dominated verbal description
- Right hem. dominated matching

+ clear evidence → left hem = analytics, right hem = spatial & music → pioneering work
- Oversimplistic → distinction less clear than verbal labels

+ standardised → presented info to 1 field at a time → valid
- Sample size and type → 11 patients and surgery → non generalisable

- Alt → duality (2 minds when split brain) → theoretical dispute

WAYS OF INVESTIGATING BRAIN

fMRI

= functional magnetic resonance imaging

- Detects change in blood oxygenation and flow
- Consumes more O when active
- Haemodynamic response = blood to active area
- 3D mapping

+ No radiation → risk free → images high spatial resolution

- Expensive → poor temporal resolution
from 5s lag → difficult to read pic

EEG

= electroencephalogram

- Measures electrical activity in brain - electrodes via skull caps
- Brainwave pattern from neuron activity

+ good for diagnosis → detects abnormalities → high resolution

- Too generalised → signal doesn't show source → cant distinguish locations

ERPs

= event related potentials

- Brain waves triggered by events
- Neural responses of sensory, cognitive and motor events
- Tests isolated areas
- Extraneous activity from EEG filtered out

+ specific → temporal resolution
→ precise role of neurons

- Lacks standardisation → hard to remove extraneous material

Post-Mortem

- Analyse brain after death
- Damage examined and establish cause
- Compare to neurotypical brain

+ improves understanding
→ Broca and Wernicke → foundation

- Doesn't determine cause
→ unrelated aspects → ethical issues

PLASTICITY & RECOVERY AFTER BRAIN TRAUMA

: apparent ability of brain to adapt structure and processes as a result of experience and new learning
= cortical remapping

Synaptic connection peak at 2-3yrs. Frequent connections strengthen and other pruned off. Constantly.

Maguire 2000 → London Taxi drivers

= more grey matter in hippocampus (spatial and navigating skills). Longer on the job, more structural differences

Draginski 2006 → Med Students Exam

= brain scans 3mth before and after. Learning induced changes in hippocampus and parietal cortex.

Functional recovery = affected areas adapt quickly after trauma and slows after several months. Rehabilitative therapy to help further.

Axonal sprouting = new nerve endings

Reformation of blood vessels

Recruiting homologous areas = opposite hemisphere takes over

+ practical application → neurorehabilitation → developed therapies to help functional recovery
- Neuroplasticity only helpful with rehabilitation

- Maladaptive consequences → phantom limb syndrome study → more problems
+ study lacks temporal validity (1999)

+ continues with ages → training increases neural representations → no limit
- Memory degenerates with age → incomplete explanation

+ animal studies → visual cortex adapted to one eye → valid
- Ethics + cant generalise

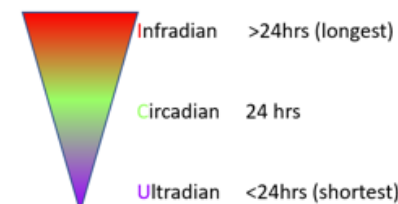
BIO – INFARADIAN AND ULTRADIAN RHYTHMS

Infradian >24hrs = menstrual cycle, hibernation, SAD
Menstruation (28 days)

- Ovulation occurs when oestrogen high (16-32hrs)
- Progesterone increases in case implants egg

McClintock 1998

- 29 women of irregular periods
- Exchanged pheromones at different stages on cycle
- 86% women experienced cycle changes



Seasonal Affective Disorder (SAD)

- Depression seasonal onset
- Low mood, lack of activity, loss of interest
- Winter blues (daylight shorter) (disruption to sleep/wake cycle)
- Melatonin – lack of light in morning – less serotonin
- Circannual rhythm (year cycle)

- Opposing evidence → 3mths in cave shortened menstrual cycle → exogenous zeitgebers affect rhythm

+ practical application → treatment for SAD is lightbox → relieves symptoms
- Placebo affect → 30% → doubts on chemical influence of phototherapy

+ animal studies → pheromones → sexual selection → supports
- Cant generalise to humans → inconclusive ideas

Ultradian <24hrs = sleep patters, meal patterns

Sleep patterns (90mins)

Stage 1 + 2 = light sleep, alpha waves to theta waves
Stage 3 + 4 = deep sleep, hard to wake up, delta waves
Stage 5 = REM = dreams, paralysed, brain activity high

Meal patterns

- Leptin made by fat tissues reduced appetite (20mins)
- Ghrelin released in stomach to increase appetite

+ evidence for sleep → brain waves analysed → REM is important part of sleep

- Don't need to recover sleep → recover mostly during REM → large flexibility within sleep

- Ignores individual differences → differences in duration of each stage → innate differences ignored

ENDOGENOUS PACEMAKERS & EXOGENOUS ZEITGEBERS

Superchiasmatic Nucleus (SCN)

- Tiny bundle of nerve cells in hypothalamus (both hemispheres)
- Primary endogenous pacemaker in mammals
- SCN is above optical chiasm and receives light info directly even when eyes closed
- Adjust to patterns of daylight whilst asleep

- SCN passes info to pineal gland

- Pineal gland increases melatonin production at night (induces sleep)

DeCoursey 2000

- Destroyed SCN connection of 30 chipmunks
- Observed in natural habitat
- Sleep/wake cycle disappears and many killed

Light

- Key zeitgeber that resets SCN
- Indirect influence on hormones and blood circulation

Murphy 1998

- Light detected by skin receptors when info not received by eyes
- 15ppt woken with light pad to correct sleeping pattern

Social cues

- 16 week baby entrained into sleep schedule (imposed by parents)
- Adapting to local times instead of own rhythm beats jet lag
- Mobile phone (light), social media

- Ethical issues → harmed when returned to habitat → unjustifiable

- Many circadian rhythms (peripheral oscillators) → act independently of SCN → complex influences other than SCN

+ evidence → light detection → regulate sleeping pattern

- Influence of exogenous zeitgebers overstated → arctic region ppl have normal sleep schedules → little affect on internal rhythm