PSYC234 Final Exam Notes

- Trying to understand psychological processes in terms of underlying biology
- Levels of study: Social, organ, neural systems, brain regions, circuit, cellular, synaptic, molecular
- Causes: Evolution influences genes, genes + experience influence development of organism, current organism and situation influence behaviour, behaviour informs on evolution and experience

Gross Anatomy

Systems

- NS > CNS (brain & spinal cord) & Peripheral > Somatic (afferent/efferent nerves) & Autonomic (afferent/efferent nerves, efferent are Para and Sympathetic)
- All cortical areas regions are association, sensory, or motor
- CNS begins growing around 20 days after conception
- Peripheral: Nerve fibres outside brain and spinal cord
- Somatic: Voluntary muscles and sensory systems
- Autonomic: Sends/receives to control behaviours like HR, blood pressure, respiration
- Sympathetic is fight/flight, Parasympathetic calm – both work towards homeostasis

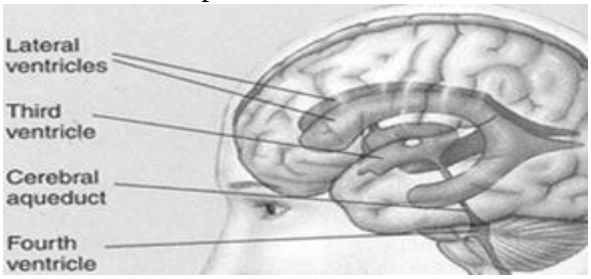
Directional Reference

- Planes: Horizontal top-down, Saggital left-right, Coronal front-back
- Superior (up), Inferior (down), Lateral (outward), Medial (inward)
- Anterior (front), Posterior (back), Dorsal (up), Ventral (down)
- Brainstem/Spinal Cord: Ventral (left), Dorsal (right)

Brain Regions

- Brain wrapped in 3 Membranes called Meninges that protect from toxin/inside threats
- Dura (2 layers) Arachnoid Pia maters

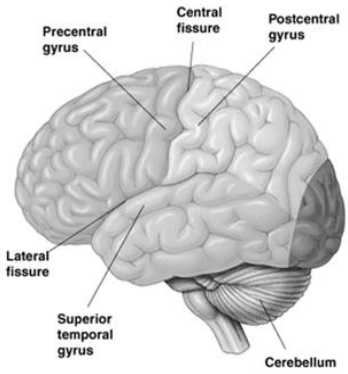
- Ventricles: Cerebrospinal Fluid (CSF), flows through central canal of spinal cord, ventricles, and subarachnoid space to protect, nourish, and remove waste. Blockage causes brain expansion



- Spinal Cord: Base of brain to below waist, sensory (body to brain) & motor (brain to body) nerves. Behaves on its own using interneurons for reflexes
- Matter: Cell bodies and dendrites reside in grey matter, travel to others via white (myelinated)
- Hindbrain: Medulla controls vital reflexes like breathing and salivation, damage often fatal, Pons is a fibre tract, Cerebellum key for coordination of fine motor skills
- Midbrain: Tectum is superior and inferior colliculi, Tegmentum controls reticular formation, contains substantia nigra
- Forebrain: Thalamus (dead centre) relays/integrates all senses bar smell, lateral nuclei vision, medial smell, ventral posterior touch. Hypothalamus below, regulates motivated behaviour through control of the pituitary gland
- Limbic System: Motivated/emotional actions, Septal (pleasure), Amygdala (emotional significance), Basal Ganglia (voluntary movement), Hippocampus (memory)

Cerebrum

- Two halves Hemispheres connected by Corpus Callosum, Cortex (convoluted outer layer), grooves = Sulci, bumps = gyri



- Occipital: Primary visual
- Parietal: Touch, somatosensory Cx, damage = unilateral neglect
- Temporal: Hearing/balance, emotion, memory, complex visual, damage = poor hearing/comprehension, memory
- Frontal: Association/integration, damage = no behavioural initiation or emotion control, less organization
- Size Irrelevance: Humans most intelligent but not biggest, no association between height and intelligence, men bigger brains but same IQ, brain size & intelligence correlation .3
- What does matter is neuronal size and density, resource allocation (25%), larger cerebrum and pre-frontal cortex ratios, more convolutions and energy expenditure

Cranial Nerves

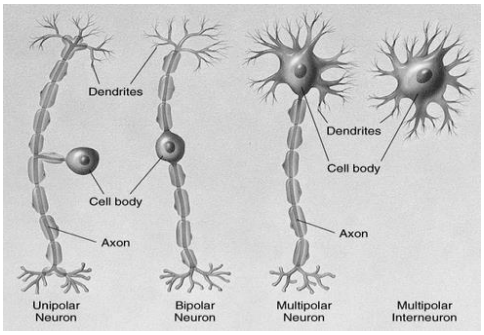
- Most peripheral nerves enter CNS through spinal cord, but 12 enter and exit the brain directly. 1-4 are hindbrain, 5-12 medulla oblongata and pons
- Olfactory: Smell
- Optic: Vision
- Oculomotor: Pupil constriction
- Trochlear: Eye movement
- Trigeminal: Facial skin sensations, jaw control
- Abducens: Eye movement
- Facial: Taste from front 2/3 of tongue, facial expression, crying, salivation
- Statoacoustic: Hearing & equilibrium

- Glossopharyngeal: Taste from back 1/3 of tongue and throat, swallowing, salivation, throat movement for speech
- Vagus: Neck and thorax feeling, control of throat/oesophagus/larynx, parasympathetic nerves to gut and organs & control of sympathetic NS
- Accessory: Control of neck and shoulder movements
- Hypoglossal: Control of tongue muscles

Neural Activity

Neurons

- Nucleus contains DNA, organelles in nucleus maintain health and processing
- Soma (cell body), Dendrites, Axon, Myelin Sheath, Terminal Buttons, Synapse
- Billions of them for reception, conduction, transmission of signals
- Soma: Nucleus, cytoplasm, cell health and transmission facilitation
- Dendrites: Collect and conduct signals
- Axon: Longer than dendrites, transmission away via Nodes of Ranvier, terminal buttons store and release neurotransmitters
- Purkinje Cells: Extreme dendritic branching, exclusively in cerebellum (prune)
- Afferent (admission), Efferent (exit)
- Glia Cells: Adjacent cell support
- Cell Membrane: Semi-permeable by chems
- - Protein and K+ potassium inside, Na+ and Cl- chloride outside, resting -70mV
- Interneurons (bipolar) signal neighboring cells within, primarily GABA
- Sensory neuron (unipolar) information to brain, afferent
- Motoneurons (multipolar) information from brain, efferent



Action Potentials

- A spike of positive and negative charge, -55mV threshold triggers all-or-nothing, potassium exits for stabilisation, impossible to re-trigger for 1ms, hard for 4ms
- APs start at Axon Hillock, travel down Axon with no reduction in strength no matter distance: 1-10m/s in unmyelin, 100m/s in myelin. Jumping called saltatory conduction
- Sodium begins the first step which is calcium channels opening
- Sodium-Potassium pump takes 3Na+ in, 2K+ out keeps neuron poised
- Na+ opening takes to 40mV, K+ out
- Na+ out is repolarization, K+ close hyperpolarization
- Most neurons fire 10/s spontaneously
- Post-Synaptic-Potentials: Molecule binding can cause graded potentials that stack into an AP or decay over time, depolarisation (+chance) = EPSP hyperpolarisation = IPSP
- Spatial summation (EPSP from multiple dendrites) and temporal summation (multiple EPSP from one dendrite) occurs constantly, integration is important for firing or not
- Probability of firing is ratio of EPSP: IPSP
- Synapse importance first thought of in 1906 by Sherrington, not established until 50’s
- Small NTs synthesized at axon terminal, stored in vesicles