Psy247 Lecture Notes

Week 1

- Transduction: first stage of any sensory process. Receptors turn energy into neural signals. Impulses travel along axons to terminals which release neurotransmitters across synapses to be received by another cell
- Hierarchical processing: neural impulses travel "up" the system to the cortex. "Relay station" in the Thalamus (except for olfaction). Higher cortical areas also involve lateral and feedback connections.
- Hierarchical Processing: Bottom-Up vs. Top Down
    - Bottom up: flow of information from sensory receptors towards "higher" cortical areas with increasing levels of complexity
    - Top down: prior knowledge influences what is perceived.
- Bottom up AND top down:
    - It is not a dichotomy. Both undeniably exist. There must be bottom up otherwise how would information get in?
    - Forward, lateral and backward connections in the visual pathway demonstrate that information can flow in all directions
- Physiological Principles
- Selectivity:
    - Within each sense, stimuli can vary along various dimensions (e.g. lines vary in location, length, orientation, etc.)
    - Cells are selective for (i.e. respond most to) stimuli with certain characteristics (e.g. a vertical line)
    - Response will be smaller the more the stimulus differs from the preferred stimulus
- Organisation:
    - Within sensory brain regions there's often an orderly progression of stimulus preferences
    - Most "important" range of stimulus values is processed by a larger amount of cortex – "cortical magnification"
- Doctrine of Specific Nerve Energies:
    - Each sense projects to a different cortical area
    - The nature of a sensation depends on which sensory fibres are stimulated, not on how fibres are stimulated
- Plasticity
    - Neural mechanisms are modifiable
    - Development
    - Recovery from brain injury
- Noise
    - Neural firing is stochastic
    - Precise firing rate determined mostly by stimulus but also by other random factors
    - Spontaneous activity – cells fire a little even with no stimulus

- Detectability
    - More intense the stimulus, the more likely you are able to detect it
    - Detection threshold (aka Absolute Threshold) – the intensity required for detecting a stimulus
    - Lower threshold is better
    - Sensitivity: the opposite of threshold; higher sensitivity is better
- Psychophysics
    - Method of Adjustment (MoA): Detection – adjust the stimulus until you can just see it
    - Method of Constant Stimulus (MoCS) – yes/no paradigm – vary the intensity, can you see it? Plot psychometric function, curved due to noise, threshold is 50% point, problems with criterion differences
    - Method of constant stimuli (MoCS) – 2AFC Paradigm – was the stimulus in interval 1 or 2? Threshold at 75%
- Discrimination
    - Discrimination threshold – the difference between two stimuli required for successful discrimination (sometimes called the just noticeable difference 'JND') – related to precision
    - Bias – sometimes called the "point of subjective equality" 'PSE' – related to accuracy
    - Precision: the degree to which repeated measurements or calculations will show the same or similar results
    - Accuracy: the degree of conformity of a measured or calculated quantity to its actual (true) value.
- Adaptation
    - Prolonged stimulation results in a decrease in the rate of firing (physiology)
    - Various perceptual consequences: increased detection thresholds for same/similar stimuli, reduction of perceived intensity for similar suprathreshold stimuli, the rate at which perceived sensory magnitude rises with stimulus intensity is increased, perceived properties of other similar stimuli can appear biased e.g. the motion after effect