Topic 1 – Learning and Cognition

Learning Outcomes:

- Understand key concepts and theories in learning and memory, and links between them.
- Core knowledge from Chapters 6 (Learning) and 7 (Memory) in the Burton et al. (2016) text.
- Lectures will review, clarify, extend and apply core knowledge
- Apply principles of learning and memory to the way the lecture content is approached.

Lecture 3 Classical Conditioning – Questions:

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1. What is learning?
    a. Learning = Lasting change in an organism's behavioural response to a particular event, based on its experience.
    b. Learning = Predicting the future from past experience and using these predictions to guide behaviour.

2. What is classical conditioning?
    a. Learning through **association**, prediction of the future.
    b. Learning to produce a reflex response to a stimulus/event that would not naturally cause it. (Reflex (e.g. salivating) is unlearned and innate.)
    c. Classical conditioning = Learning an association between a stimulus that reliably predicts another stimulus that is naturally associated with a reflexive response that is appetitive or defensive.

3. Why is classical conditioning important?
    a. Important to learn **associations** between stimuli/event in the environment that reliably **predict** other events/stimuli in the environment, especially stimuli that relate to **survival**.

4. What is the order of presentation of stimulus for an individual to learn an association?
    a. Neutral stimulus (NS) precedes the Unconditioned stimulus (UCS), so when NS becomes conditioned stimulus (CS), the CS is predictive of the response.
    b. **[NS (bell) preceding UCS (food) for association & prediction. Bell predicts likelihood of food, and reflex occurs in response of food.]**

5. What is the 3-stage process of classical conditioning, including NS, UCS, UCR, CS, CR?
    - Before:

NS (bell) --> No response
UCS (food) --> UCR (salivation)

    - During (acquisition):

NS (bell) + UCS (food) --> UCR (salivation). **[NS (bell) preceding UCS (food) for association & prediction. Bell predicts likelihood of food, and reflex occurs in response of food.]**

    - After:

CS (bell) --> CR (salivation)

6. What is the difference between stimulus generalisation and stimulus discrimination?

   Stimulus generalisation occurs when an organism learns to respond to stimuli similar to CS (bell, bang, phone ring) with a similar response (salivation).

   - E.g. Little Albert: CS (white rate) --> CR (fear), but: other stimulus similar to CS (white rate) also elicits CR (fear), such as white furry animals, Santa clause, etc.
   - E.g. Dog may also salivate to another bell tone, but response may not be as strong, depending on how different the bell sound is.

   Stimulus discrimination occurs when an organism learns to respond to a restricted range of stimuli.

   - E.g. Dog only salivates (CR) when it hears bell (CS) only / one particular tone, and not other similar stimuli such as bangs, phone rings, etc. How? --> Extinguish the generalisation responses, by ringing a number of bells that predict no food, and only ring one bell sound that predicts food. --> Eliminate tendency to generalise between stimulus.
   - E.g. Humans only get hungry (CR) at 6:00pm (CS), not at other times such as 4:00pm.

7. Distinguish between extinction, spontaneous recovery and rapid re-acquisition?

   - ***Extinction*** occurs when a CR (salivation) is weakened by presenting the CS (bell) without the UCS (food), given that enough trials are presented. Associative learning becomes suppressed, but not fully extinguished. Extinction, like all learning, will be stronger if the extinction trials are spaced over multiple periods (spaced).
     Why?
   - ***Spontaneous recovery*** is the short-term reappearance of a previously extinguished CR (salivation) in response to the presentation of a conditioned stimulus (CS) again, after a period of rest. (smaller strength recovery response).
     Each time, the spontaneously recovered response will decrease.
   - ***Rapid re-acquisition*** is when the individual re-learns the conditioned response, after extinction. Organism would learn association much faster than original training, in fewer trials. --> [Learning was never fully lost/goes away, only suppressed.] Extinguished response is still dormant within the organism's nervous system and can be rapidly relearned.

8. What do rapid re-acquisition and spontaneous recovery suggest about learning?

   - **[Learning was never fully lost/goes away, only suppressed.] Extinguished response is still dormant within the organism's nervous system and can be rapidly relearned.**

9. How does biology constrain the associations that can be learned by classical conditioning (Biological preparedness and specifies-specific)?

   - ***Prepared learning (biological preparedness)*** **is the biologically wired readiness to learn some associations more easily than others.**

Lecture 6 – Attention & Awareness: Consciousness and the Brain

Learning objectives:

1. Understand the neural pathways that subserve unconscious visual perception in '**blindsight**'
2. Explain the effect of **selective attention** on information processing in the brain
3. Outline how the **effects of spatial selective attention** can be seen in the parietal lobe
4. Explain the syndrome of **unilateral spatial neglect**
5. Reflect on **unconscious perception of neglected stimuli** and implications for consciousness

Concept of attention

1. William James (1890) - "**Taking possession of the mind**", "Withdrawal from some things in order to deal with others..."
2. —> Set of processes by the brain to **select** relevant stimuli/behaviour for controlling behaviour and **inhibit** irrelevant stimuli/behaviour

Explain the effect of selective attention on information processing in the brain

Aspects of attention:

1. **Capacity** limit (3-4 things at a time)
2. **Vigilance** (period of time - sustenance)
3. **Perceptual set** (relevant, expectation)
4. **Switching** (tasks/environment)
5. **Selective attention** (space, time, movement, e.g. particular face in a crowd)

Selective attention

1. Covert **selective attention** (Helmholtz) - **voluntary attention** allocation can **enhance** stimuli perception in a **selected area** (e.g. staring at a fixed circle)
2. (Posner, 1980) spatial cueing task - attention enhances rate of information processing at attended locations than unattended locations (quicker reaction time)

Inattentional blindness

1. Fail to notice **obvious** unexpected stimuli due to **attention** being **diverted**/engaged elsewhere

Understand the neural pathways that subserve unconscious visual perception in 'blindsight'

Blindsight

1. **Blindsight - perceived visual functioning in the absence of vision:**
    1. Pupillary reflex (reflexive response)
    2. Locating visual targets (using hand/eye movements)
    3. Shape/wavelength discrimination
2. Due to **one-sided/unilateral damage to Primary Visual Cortex**
3. Evidence:
    1. DB —> **detect visual stimuli he couldn't see**
    2. GY (left side damage) —> locate visual stimuli (light) he couldn't consciously see by pointing
4. Neural basis - how does visual info get to the brain when one is blind?
   Blind path - Geniculostriate pathway:
    1. Optic tracts (ganglion axons) —> LGN (90%) —> Primary visual cortex (damaged)
       Visual preservation in blindsight:
    2. **10% of axons** —> Superior colliculus (SC) and Pulvinar nucleus (thalamus) —> visual cortex areas —> visual preservation

3. SC is responsible for controlling the orientation of responses to sudden visual and auditory stimuli

5. -> Dissociation between conscious and unconscious perception

Outline how the effects of spatial selective attention can be seen in the parietal lobe

1. Neurons in parietal lobe changes their firing rate according to the attentional demands of the task.
2. Damage to parietal lobe --> Unilateral spatial neglect = inability to see contralesional side of world
3. Can be detected by clinical trials (e.g. MRI)

Explain the syndrome of unilateral spatial neglect

Unilateral spatial neglect

Cause:

1. **Damage to one side of brain** (usually **right** hemisphere)

Symptoms:

1. **Contralesional side blind** (affected side of space - left side):
    1. Ignore food on one side of plate
    2. No shave/makeup on one side of face
    3. Bump into things on one side of body
2. **Unaware** of disorder (unlike hemionopic patients —> 1/2 side blind)
3. Most severe and common after damage to Inferior parietal lobule (IPL) in **right** parietal lobe —> **affects selective attention**

Other areas where damage may cause unilateral spatial neglect:

1. STG (superior temporal gyrus)
2. IFG (inferior frontal gyrus)
3. Mfg (middle frontal gyrus)

Reflect on unconscious perception of neglected stimuli and implications for consciousness

1. Although patients with parietal damage (and hence unilateral spatial neglect) cannot consciously perceive visual stimuli from their damaged hemifield, they may still be able to **unconsciously process neglected stimuli that they can't see.**
2. E.g. Damage to right parietal lobe, loss of conscious vision for left side, but can still unconsciously process things on left side.
3. E.g. House experiment: "Which house would you live in?" Patients chose the house without the fire, even though they couldn't consciously see the fire on the first house.