LEARNING AND MOTIVATION

Lecture 1 - Learning: Biological Bases of Behaviour

Learning: an *enduring change* within an organism brought about by *experience* that makes a change in *behaviour* possible.
Enduring: change is relatively stable (ambiguous definition of transient/stable)
Change: limitations of observations – happens outside of timeline/monitoring
Experience: (history affects) practice/previous trials

NOT synonymous with:
Performance: affected by variables outside scope of learning: opportunity, motivation and (changes in) sensory/motor capabilities

Reflex: innate, automatic corresponding response to stimuli; self-governing, reduce stimulation of primary afferents (not based on experience, genetics)

- Blinking response to loud noise in 6 month foetus
- (Infants) rooting (feeding) and moro (latching) reflex
- Patellar reflex (knee jerk)
- Startle reflex (quick automatic engagement of aggressive behaviour)
- Movement -> (eye) orienting response
- Air-puff -> eye blink
- Food -> salivation
- Movement -> eye turn
- Knee tap -> knee jerk
- Pain -> withdrawal

Reflex arc: stimuli -> activate sensory (afferent) nerves -> activates interneuron in spinal cord -> activated motor (efferent) nerves -> stimulate muscles

Instinct: *behavioural sequence* (complex) made up of units, which are largely *genetically determined* and typical of all members of a species (different from reflex in its complexity)

- Mating Rituals (bird of paradise's picking leaves off "stage" motion w/o leaves)

Maturation: changes that take place in your body and in your behaviour due to aging

- Infant "learning" to walk (development of muscles for an instinct)

Fatigue: transient state of discomfort and loss of efficiency as normal reaction to emotion strain, physical exertion, boredom, or lack of interest; may lead to *physical inability* to perform a learned response (not lack of learning)

Use of animals: (find similarities between animal & humans in relevant features)

- Simpler conditions (humans esp. mind/culture influences – too complex)
- Easily controlled (consciousness of humans deter validity/accuracy)
- Less expensive
- Can monitor background (can dictate entire habitat)
- Wider scope (deprivation, stress, aversive events)

Types of Learning:

- Habituation and sensitisation
- Classical (Pavlovian) conditioning
- Instrumental (Operant) conditioning
- Complex (rule) learning
- Social learning
- Language mediated learning

Habituation: decrease in response strength that occurs as a function of (a single) repeated stimulation.
E.g. Rat in Skinner box: loud noise -> scare -> repeat -> no response
Habituation: decreased responding produces by repeated stimulation

- Not fatigue: incapacitated
- Not sensory adaptation: temporary de-sensation of sense organs to stimulation – e.g. bright light/loud noise)

Sensitization: Increased response produced by repeated stimulation (condition in which stimulation applied to one part of the body causes another part of the body to become more sensitive.)

- E.g. rats run more in response to the same amount of cocaine when they are pre-exposed to cocaine
- (Skinner box – rats): background noise results in more vigorous startle reaction to a tone
- Need for habituation/sensitisation: help us sort out what stimuli to ignore and what to respond to; to help us to organise and focus our behaviour amongst extra stimuli

Disorders in Habituation:
In people with no mental illness – neural response in hippocampus decrease with repeated presentations of pictures of emotional or neutral faces
Clinical applications:

- Diagnosing mental illness is often difficult,
- Early detection facilitates treatment and often leads to better outcomes; thus improving diagnoses is very important
- Impaired habituation in people with schizophrenia compared to people with no mental illness
- Diagnostic test, assess habituation to stimuli and compare to sample of people know to have no mental illness (currently being developed using auditory stimuli) - May enable detection even before the presence of symptoms

NOTES:
Applications of LAM psychology: (including everyday situations)

- Drug use behaviour (addiction, tolerance etc.) that changes with experience
- Deciphering cause and effect???

- Multitasking possible due to autonomisation of tasks (learning)
- More complex organisms show ability to adapt to environment (e.g. kangaroos forage outside of industrial grazing lands where there is competition for resources)

Lecture 2 - Learning: Pavlovian conditioning

Classical conditioning/Pavlovian Conditioning:
Unconditional stimulus/response & conditional stimulus/response

- **Unconditioned stimulus (US):** evokes a response unconditionally
- **Unconditioned response (UR):** response evoked by the **US**
- **Conditioned stimulus (CS)**: stimulus that evoke response because it has been paired with the **US**
- **Conditioned response (CR)**: the response evoked by the **CS**

US → UR
↓ing stimuli
CS → CR

- non-permanent but long term learning

Pavlov's terminology:

- Food = *Unconditioned stimulus (US)* – unconditionally evokes a response
- Bell = *Conditioned stimuli (CS)* – a stimulus that evokes a response because it has been paired with the US
- Salivation = *Unconditioned response (UR)* – the response evoked by the US
  = *Conditioned response (CR)* – the response evoked by the CS

Factors that affect classical conditioning: (learning curve: strength of CR/trials – log function that tapers towards asymptotic maximum)

1. **Frequency**: ^CS-US → CR reaches high strength
2. **Intensity**:
   - ^Salience of CS (^dB bell) → ^rate of learning (not maximum limit)
   - ^ Salience of US (^good food) → ^maximum limit of response
3. **Contiguity (timing** between onset of CS/US - IS**)**: ^→ decreased response (decrease results in better learning??)
4. **Contingency**: probability of US following CS ^→ better learning

Contingency: a future event/circumstance that is possible but cannot be predicted with certainty

- Need to know: probability that US follows CS; probability of US occurring
- Learning about the causal, structural and predictive relations between events and stimuli

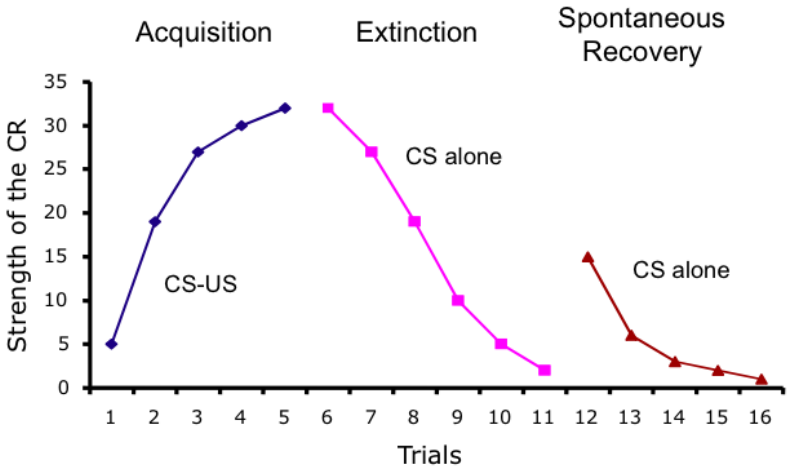
Second Order Conditioning:
Established CS (that elicit a CR) presented with a neutral stimulus, CS1 is removed, and the neutral condition still elicits a CR.
Phase 1: CS1 (bell) + US
Phase 2: CS2 (light) + CS1 (bell) => test for CS2 independently

- Once CS acquires a conditioned response -> can act as US in conditioning
- Change in behaviour can be transferred (demonstrates flexibility in learning)

Acquisition: learning - when CS (bell) is repeatedly paired with US (food)
Extinction: Diminishing of CR when CS is presented repeated without US

- The weakening of the CR when the pairing between the CS and the US is ceased repeated CS alone presentations follow acquisition resulting in a reduction in the CR

- Reversal of the learning process =/= unlearning (complex: spontaneous recovery)



NOTE:

40 years before: classical conditioning – too specific – just a physical reflex due to stimulus substitution – cannot reflect overall human congition/psychology

Contemporary view: viewed as a more complex, cognitive psychological process, can gain insight into general learning principles (applies to responses beyond instinctive human responses)
E.g. fear conditioning:

- UR: heightened activity, seeking shelter etc.
- CR: freezing (fear + anxiety)
- Not just transfer of response to another stimulus -> reflects changes in internal state

Examples of Classical Conditioning:

- Food/place preferences: (e.g. vanilla paired with sweetness -> likes vanilla, infants have no preference for it)
- Eye-blink conditioning
- Conditioned fear
- Anticipated nausea
- Conditioned taste aversions: in chemo patients – nurse -> nausea
- Place avoidance

Applications of Classical Conditioning:

- Understanding of learning (cognitive psychology)
- Advertisements (pairing US with CS) e.g. sex appeal – based on our ignorance of the effect (sometimes knowing =/= diminish desire)
- Overcoming CR (anticipated nausea) and phobia (CR) through extinction

Sexual Fetishes; Conditioned taste aversion

(*Watson, behaviourism, 1930): "give me a dozen healthy infants, well informed and in my own specified world to bring them up in and ill guarantee to take any one at random and train him to become any type of specialist I might select, regardless of his talents, penchants, tendencies, abilities, vocations and race."*

Lecture 3 - Learning: Instrumental Learning

Instrumental learning: involves circumstances where behaviour determines the events that follow
(Thorndike): The likelihood of a behaviour's increase or decrease determined by

- The nature of the events that follow (appetitive/aversion)
- Whether the behaviour produces or terminates these events
- Are the above two "factors that influence instrumental learning?"

Thorndike's Law of Effect: Action of a human or animal is strongly influenced by the immediate consequences of such behaviour in the past.
"Of several responses made to the same situation, those that are accompanied or closely followed by satisfaction to the animal will, other things being equal, be more firmly connected with the situation, so that, when it recurs, they will be more likely to take the same action" (Thorndike, 1911)

Thorndike's puzzle box:

1. Cat locked in a puzzle box
2. Cat makes the "right" response
3. Door opens
4. Eat treat

Recorded *trial and error* (time to escape graphed against discrete trials): observed progressive improvement over many trials – incremental decrease -> evidence for incremental learning

(B.F. Skinner): discrete trial procedure is limited because:

- When a subject can respond is constrained
- One response and/or reinforcer per trial
- Handling stress (of taking cat out/into box)

Free operant procedure: Correct response determines the outcome

1. Rat placed in Skinner Box
2. Rat makes right response
3. Rat gets food
4. Repeat from 2.

Radical behaviourism: (reactionary o psychology in that time period – based heavily on introspection and psychoanalysis) rejects anything unobservable (belief that all human psychology was reducible to relationship between stimuli and response)

Difference between conditional and instrumental learning:

- Pavlov: The subject has NO control over events, but *responds to them*
- Thorndike/Skinner: The subject has to respond to *control the OUTCOME*

The behaviour is *instrumental* in determining what happens
Reinforcers: events that result in an increase in a particular behaviour

- *Primary reinforcers:* intrinsically valued/not learned (e.g. food, water, sex)
- *Secondary reinforcers:* acquire their reinforcing properties through experience (e.g. clicker with dog)
- Social reinforcements: (e.g. praise)

- Conditioned → anything that is paired with primary reinforcer
- Secondary → acquire their reinforcing properties through experience
- Social → praise

Shaping: principle of successive approximation

- *Reinforce* behaviours that are closer and closer to a target-behaviour;
- Gradually make the conditions of reinforcement more stringent/precise;
- Can generate entirely novel behaviours (rat pressing bars/dogs opening doors)
- Can lead to a response chain – build up complex repertoire of responses by breaking down into units
- E.g. development of tantrum (progressively more severe emotional response)
- Superstitious behaviour (in pigeons and humans)

Response-consequence contingencies

The consequence	**Appetitive**	**Aversive**
R Produces Consequ.	Positive Reinforcement: ***R increases***	Positive Punishment: ***R decreases***
R Terminates Consequ.	Negative Punishment (omission): ***R decreases***	Negative reinforcement (Escape/Avoid): ***R increases***

Types of instrumental leaning:

- **Positive reinforcement:** positive relationship between behaviour and consequence e.g. dog given a treat for good behaviour
- **Negative reinforcement:** negative relationship between behaviour and consequence e.g. rats associates warning light with shocks and jumps over barrier to avoid shock
- **Positive punishment (escape/avoidance):** e.g. dog punished for bad behaviour -> good behaviour
- **Negative punishment (omission):** expectation of appetitive consequence not met e.g. time out (withholding attention) and cutting pocket money

Escape learning: escapes shock by leaping over area
Avoidance: jumps at warning (avoids shock)
Escape Learning: (escape = turning off some currently occurring aversive event)

- A barrier divides the shuttle box (1/2 has a grid floor)
- A warning signal (WS) comes on, followed by a mild foot shock through the grid floor
- Subject escapes the shock by leaping over the barrier to the safe area

Avoidance: (avoid = preventing some aversion event from occurring)

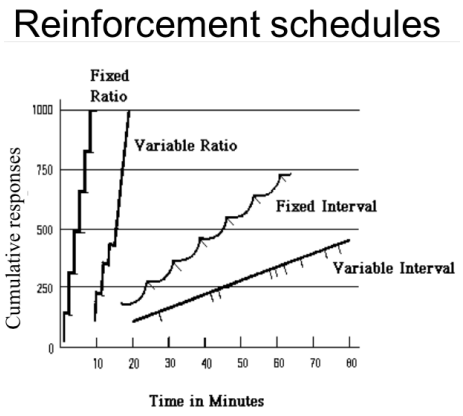
- Animal soon learns to jump over the barrier when the warning signal comes on and avoids the shock altogether

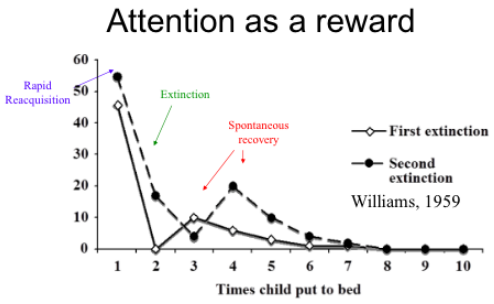
Contiguity: (behaviourist approach) response must occur in the presence of or very soon after a stimulus is presented for learning to occur (or an association will not occur

(Behavioural) Contingency: the possibility that there may/may not be a relationship between an individual's specific response and the frequency and regularity by which that response has been reinforced (e.g.? expectations on the consequences of certain behaviours that shape the behaviour)
e.g. expectation that people will arrive late for a party makes you condition yourself to arrive late as well

Reinforcement schedules in everyday life:

- Piecework in factory reinforced on a *fixed-ratio* schedule
- Playing a slot machine based *on variable-ratio* reinforcement
- Watching clock at work reinforced (rewarded) on a *fixed-interval* basis
- Waiting to surf a big wave rewarded on a *variable-interval* basis





Applications:

- Obesity
- Addictions

Analysis of drug abuse: (spiralling from use -> abuse)

- Source of positive reinforcement
- Source of negative reinforcement
- Goal directed/habit
- Treat with punishment, extinction, and or omission?
- Role of habituation, classical conditioning, discrimination learning, social learning