Pavlovian Conditioning

- People are born with certain stimulus-response relationships that are built-in to our bodies

- These relationships are called *unconditional reflexes*

- These unconditional reflexes are familiar to everyone

- Called unconditional because they have not been learned

Examples of unconditional reflexes

Unconditional Stimulus	Unconditional Response
Puff of air to the eye	Eye blink
Food in the mouth	Salivation
Cold Temperature	Shivering
High Temperature	Perspiration
Foreign matter in nose	Sneezing
Foreign matter in throat	Coughing
Spoiled food	Sickness, vomiting

- The stimulus that causes the response is an *unconditional stimulus (US)*

- The response caused by the unconditional stimulus is the *unconditional response (UR)*

- The unconditional stimulus *elicits* the unconditional response

- If you say a string of random words but always squirt a person in the face immediately after saying the word "pear," you can condition the person to flinch at the word "pear" without squirting them in the face with water

- By pairing the squirting of the water with the word "pear," the person learns associates being squirted with hearing that particular word

- Therefore, the reflex of flinching becomes transferred or "conditioned" to occur with the neutral stimulus
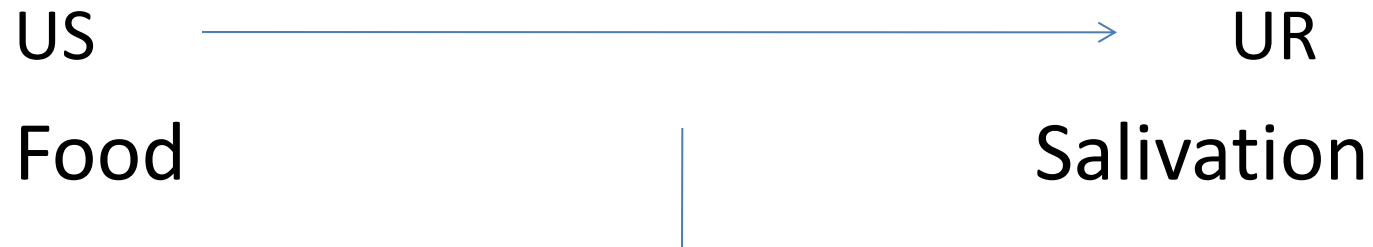
Pavlovian/Classical/Respondent Conditioning

- Learning that builds on unconditional responses

- Ivan Pavlov and his dogs

- Most basic demonstration:
  - Food as a *US* and salivation as a *UR*
  - Before putting food in the dogs mouth he sounded a metronome
  - Predictive relationship between sound of metronome and the *US* (the food)

- The metronome sound predicted the food because:
  - A: whenever the metronome sounded, food came soon afterward
  - B: whenever the metronome was silent, no food was delivered

- Once there was experience of the predictive relationship the dog began to salivate to the metronome alone
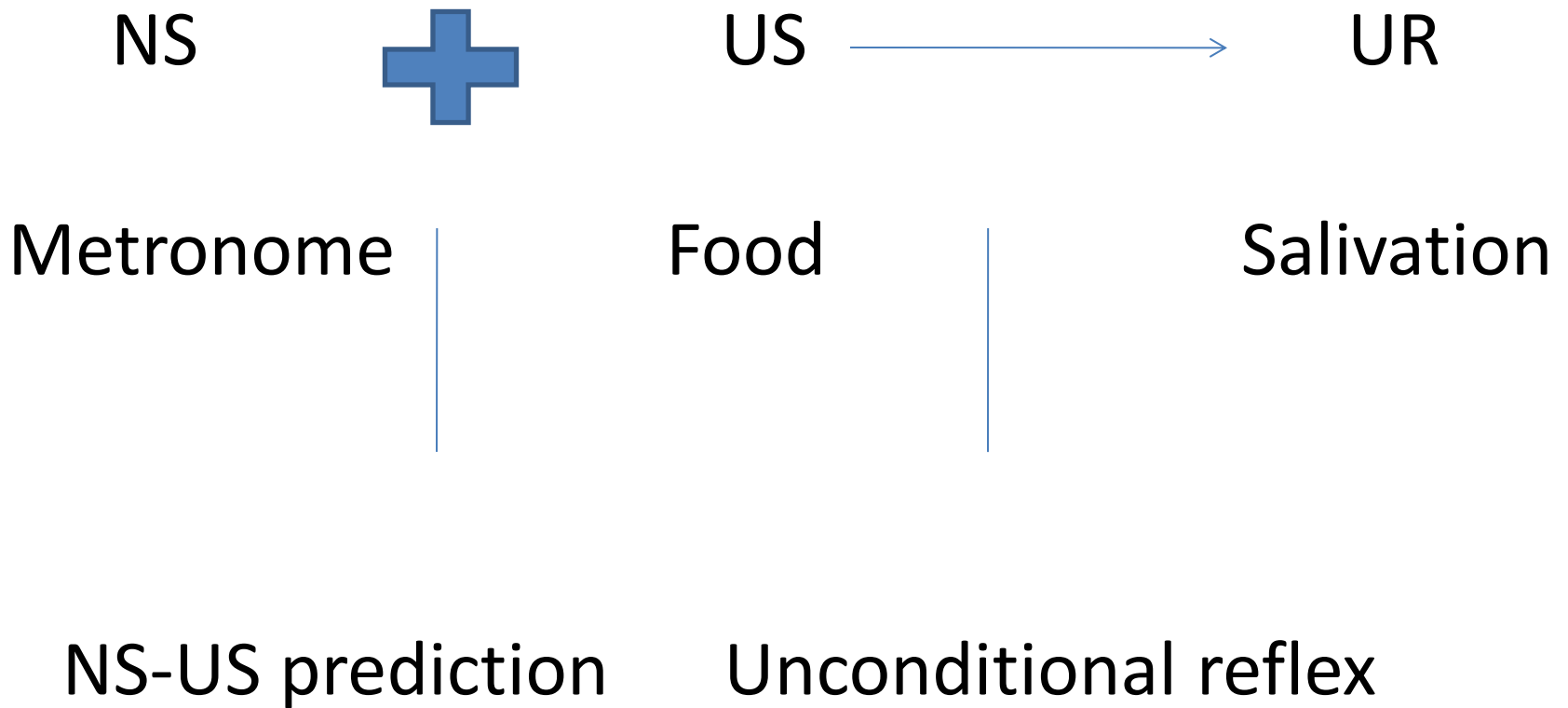
- Before conditioning took place it is said that the metronome sound was a neutral stimulus (*NS*)
  - It had no effect on salivation

- After conditioning the metronome sound became a conditional stimulus (*CS*) for salivation

- The response that a *CS* elicits is a conditional response (*CR*)
  - Salivation to the metronome was the *CR*

Basic Procedure

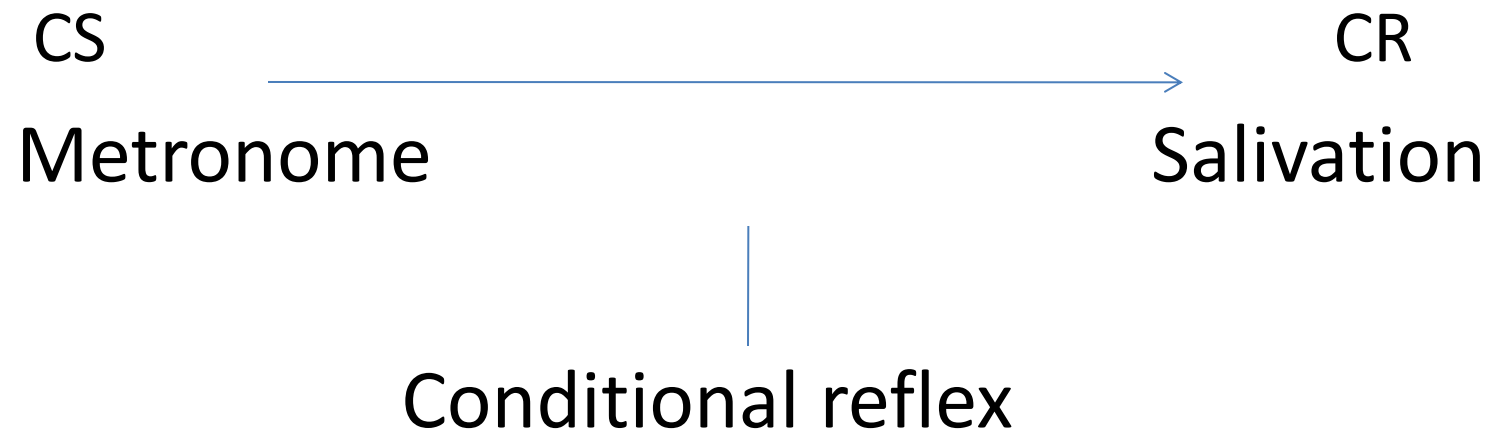US   →   UR

Food   Salivation

Unconditional reflex

Basic Procedure

NS $\quad\boldsymbol{+}\quad$ US $\longrightarrow$ UR

Metronome | Food | Salivation

NS-US prediction $\quad$ Unconditional reflex

Basic Procedure

CS   CR

Metronome   Salivation

Conditional reflex

Further Examples

Classical Conditioning

food	salivation
US	**elicits UR**
food + *bell*	salivation
US + CS	**elicits UR**
bell	salivation
CS	**elicits CR**

Classical Conditioning

food	salivation
US	**elicits UR**
food + *football*	salivation
US + CS	**elicits UR**
football	salivation
CS	**elicits CR**

- Each pairing of *CS* and *US* is one trial and this is the procedure we know as Classical Conditioning

- Important to note:
  - The presentation of the two stimuli is independent of the behaviour of the organism
    - (presented regardless of what the organism does)
  - The behaviour is a reflex response

Practical

- 15 mins

- In the following examples identify the:
    - **US**   (Unconditional Stimulus)
    - **UR**   (Unconditional Response)
    - **CS**   (Conditional Stimulus)
    - **CR**   (Conditional Response)

- Clearly then the ability to develop conditional reflexes would give an organism a chance of surviving in a changing world

- Reacting to certain sights, smells and sounds instead of waiting for an attack will ensure our survival

- A variation of the basic procedure that is more beneficial to humans is higher-order conditioning

Higher-Order Conditioning

- Conditioning can also occur without a US

- Pairing a neutral stimulus with a well established CS can produce effects much the same as if the stimulus had been paired with a US

- The procedure of pairing a neutral stimulus with a well-established CS is higher-order conditioning

Higher-Order Conditioning

First Order Conditioning	
food	salivation
US	elicits UR
food + *bell*	salivation
US + CS	elicits UR
bell	salivation
CS	elicits CR

Second Order Conditioning	
bell	salivation
US	elicits UR
bell + ▦	salivation
US + CS	elicits UR
▦	salivation
CS	elicits CR

Higher-Order Conditioning

First Order Conditioning		
dog bite		fear
US		elicits UR
dog bite + *bus shelter*		fear
US + CS		elicits UR
bus shelter		fear
CS		elicits CR

Second Order Conditioning		
bus shelter		fear
US		elicits UR
bus shelter + *sight of bus*		fear
US + CS		elicits UR
sight of bus		fear
CS		elicits CR

- Higher-order conditioning increases the importance of Pavlovian Conditioning

- It means that many more stimuli can come to elicit conditional responses

- Higher-order conditioning is effective in establishing verbal stimuli as CSs (Staats & Staats, 1957; Moran, 1981)

- Many words we use are CSs for our emotional and evaluative responding
- We respond with positive emotions to words such as *happy, baby* and *love*
- Negative emotions to words such as *murder, rape* and *wicked*
- These emotional reactions these words stir in us are through previous learning
- Very young children do not respond emotionally to words in the way that adults do

Staats and Staats experiment

- Showed that words with positive and negative references could be used to change people's evaluations of neutral stimuli

- Uni students were showed nonsense syllables: xeh, yof

- Paired with either positive (e.g. beauty) or negative (e.g. thief) words

- 1:CS $\longrightarrow$ UR

  Thief   Bad Feelings

2: NS ✚ CS $\longrightarrow$ CR

Xeh   Thief   Bad feelings

NS-CS prediction   **Old Conditional reflex**

3:CS $\longrightarrow$ CR

Xeh   Bad feelings

New conditional reflex
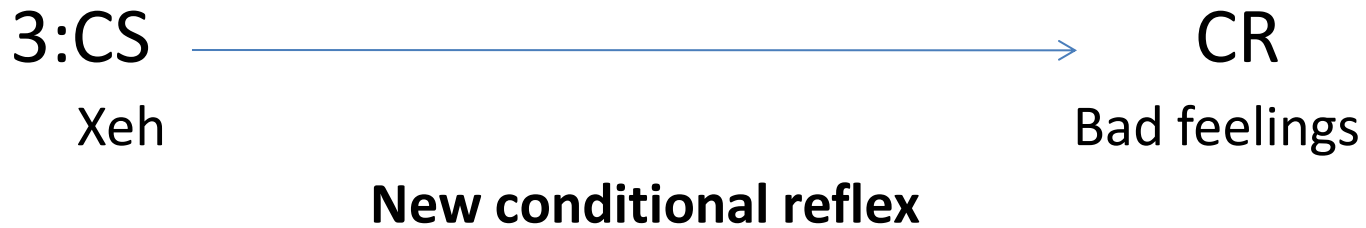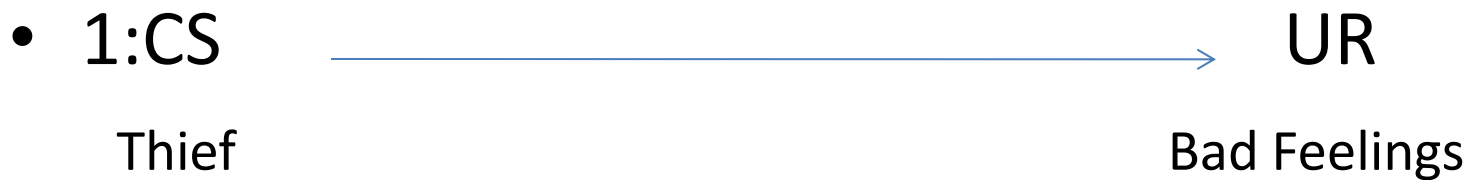
- Results indicate that when a nonsense syllable was regularly associate with pleasant words, it became pleasant, when it was paired with unpleasant words it became unpleasant
- YOF came to elicit good feelings in some students and bad feelings in others, depending on the words with which it was paired
- Higher-order conditioning would appear to play an important role in the emotional meaning of words

- Higher-order conditioning using word CSs has been successful in solving behaviour problems:
  - Phobias
  - Discourage smoking, alcohol consumption and drug use in children
  - Reduction of racist behaviour

So how do we measure learning?

- How do we know when learning has occurred if the US, is by definition capable of evoking the UR?

- Learning can be measured by the **latency** of a response

  – The interval between the onset of the CS and the first appearance of saliva

- More pairings, a response latency diminishes

- What if the interval between CS onset and the appearance of the US is so short that measuring latency is very difficult?
- **Test Trials**
- Involves presenting the CS alone every now and then
- If salivation occurs when there is no food then salivation is clearly a conditional response to the tone
- Test trial data is plotted on a curve therefore learning is represented as an increase in the frequency of the conditional response

- You could also measure the intensity or amplitude of the CR

- Initial CRs are quite weak (a drop or two)

- Repeated trials result in an increase in saliva flow

- Learning is represented by the increase in the number of drops of saliva

Variables affecting Pavlovian Conditioning

- The manner of which the conditional and unconditional stimuli are paired is an important variable to remember

- Four basic ways to pairing stimuli:
  - Trace
  - Delayed
  - Simultaneous
  - Backward

Trace Conditioning

- The CS begins and ends before the US is presented

- However, to maximise the conditioning process, research has demonstrated that short NS-US intervals should be used

- E.g. thunder and lightening storm

Delayed Conditioning

- The CS and US overlap
- The US appears before the CS has disappeared

- E.g thunder and lightening storm

- *Most studies of Pavlovian conditioning involve one of these two procedures*

Simultaneous Conditioning

- The CS and US coincide exactly

- Weak procedure for establishing a conditional response

Backward Conditioning

- The CS follows the US

- E.g. a puff of air into a person's eye then followed by the sound of a buzzer

- Very difficult (near impossible) to produce a CR with this procedure

- *Simultaneous and Backward procedures rarely used in studies *

CS-US contingency

- A behaviour is contingent on a certain event

- Been suggested that the effectiveness of Pavlovian procedures varies with the degree of contingency between CS and US

- To ensure rapid learning create a high degree of contingency between the CS and the US

Prior experience with CS and US

- Exposure to a potential CS before training reduces its effectiveness during the conditioning procedure
- Shrimp, Stuart and Engle (1991) conditioned positive emotional responses to different colas
- Well known brands, moderately known brands and obscure brands

- Used attractive pictures as the Uss
- Conditioning was more effective with the unknown and moderately known brands
- WHY?
- Ceiling effects: people have been extensively conditioned to coke and pepsi through advertising
- Difficult then to improve these conditioning effects further

- Another explanation was the CS pre exposure effect

- More difficult to condition positive responses to well-known brands because people have more extensive pre exposure to them

Extinction of Conditional Responses

- A response can be maintained as long as the conditional stimulus is sometimes followed by the unconditional stimulus

- Repeated presentations without the CS the conditional response will become weaker and weaker

- Extinction is the term for repeatedly presenting the CS without the US

- When the CR no longer occurs it is said to be extinguished

- However, just because the response has been extinguished does not mean that it will never come back
- Spontaneous recovery can occur
- This is the reappearance of the response when the CS is presented once again

- Can occur even if training discontinues for weeks or months

- Pavlovian conditioning does not begin and end with dogs in a lab

- Proven to be immensely useful in understanding a wide range of human and animal behaviours

- Next week we will look at the application of these procedures…