Sample from Lecture 9: Extinction and the Rescorla-Wagner Model

According to the R-W model, V returns to 0, meaning the subject has "unlearnt" the association

But this is not true because there is evidence that prior learning survives extinction and responding can be restored:

1. Spontaneous recovery of responding
2. Rapid reacquisition of responding
3. Renewal and reinstatement of responding

All these also explains relapse phenomena

Spontaneous Recovery
- Extinguished responding can spontaneously recover after a waiting period

Spontaneous Recovery	
Test	Rats were either tested 1. 1 day after extinction or 2. 11 days after extinction
Results/ Findings	Rats who were tested 11 days later responded more than at the end of extinction and the group that was tested a day after - Indicates spontaneous recovery of CS-US association just by waiting

Rapid Reacquisition
- Rabbits reacquire eyeblink CR to tone faster than naive rabbits
- R-W model states that both rabbits will learn at the same pace
- Suggests the rabbits haven't completely forgot what the they had learnt prior

Renewal
- After extinction of responding in one context, responding can be renewed if the CS is presented in a <u>different</u> context

Renewal (via different context)	
Test	Extinction A: Tested in the same context that CS was extinguished in Extinction B: Behaviour was extinguished in a different context than where CS is tested
Results/ Findings	Any change in context can renew responding that has been

	extinguished - Changing the context for the first time at the time of extinction can also cause renewal

Reinstatement
- After extinction, responding can be reinstated if the US is presented alone
- Little reminder kinda deal

Inhibition explained by the R-W model	
Components	Excitatory CS (**A**) predicts US - Associative strength of A > 0 Stage 2: **A** is presented with new CS (**X**, starting with no associative strength) and no US is delivered - Creates negative discrepancy (US is expected but absent - There is a negative prediction error (a discrepancy between what was predicted and what actually happened)
Explanation	$$\Delta V = \alpha \times \beta \times (\lambda - \sum V)$$ $\lambda = 0$ because there is no US $$\Delta V = \alpha \times \beta \times (0 - \sum V)$$ $\sum V$ is positive because A has a positive associative strength, so there is a positive prediction of the US $$\Delta V_A = \alpha \times \beta \times (\lambda - [V_A + V_X])$$ $$\Delta V_A = \alpha \times \beta \times (0 - [1+0])$$ $$\Delta V_A = \alpha \times \beta \times -1$$ ΔV_A = Starts to lose associative strength $$\Delta V_X = \alpha \times \beta \times (\lambda - [V_A + V_X])$$ $$\Delta V_X = \alpha \times \beta \times (0 - [1+0])$$ $$\Delta V_X = \alpha \times \beta \times -1$$ ΔV_X = Loses associative strength (acquiring negative associative strength) from the get go Response is based on how much V_A is left after subtracting V_X - How safety signals work

	V_A - V_X

Safety Cues and Extinction	
Test	A and B are excitatory CSs (previously paired with US) X is a conditioned inhibitor What happens if you extinguish B... 1. By itself 2. With X Test for B
Results/ Findings	R-W model: When X and B are together, the animal will be expecting nothing to happen (=no prediction error) - X will stop the extinction of B

Super Conditioning	
Test	Pairing a new novel CS (Y) with the associative strength of 0 with a previously conditioned inhibitory CS (X)
Results/ Findings	R-W model: $$\Delta V_Y = \alpha \times \beta \times (\lambda - \Sigma V)$$ ΣV is negative because of the inhibitor (negative prediction) $$\mathbf{\Delta V_Y} = \text{Will be positive}$$ Since we made a negative prediction at the start but something did happen, the stimulus becomes extra surprising

Mysterious Conditioning (WRONG)	
Test	Presenting the CS (X) with a neutral CS (Y) and no US
Results/ Findings	R-W model: $$\Delta V_X = \alpha \times \beta \times (\lambda - \Sigma V)$$ ΣV is negative because of X $\lambda = 0$ because no US ΔV_X = Becomes positive - ΔV will be positive for both X and Y

	R-W suggests that Y will start gaining associative strength to the US just by virtue of being presented with X **HOWEVER, THIS IS WRONG**