where were we

	excitatory (+1)	inhibitory (-1)
appetitive (+1)	**+1** **Hope**	**-1** **Frustration**
aversive (-1)	**-1** **Fear**	**+1** **Relief**

☐ appetitive motivation/affect system
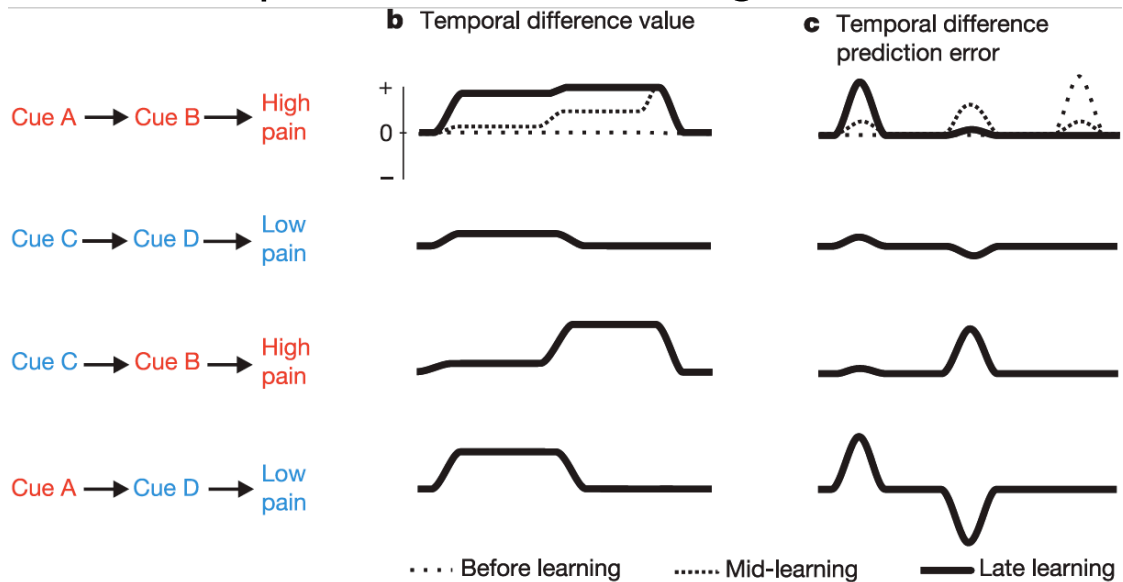☐ aversive motivation/affect system

fMRI of aversive conditioning

2nd order conditioning
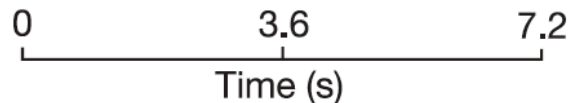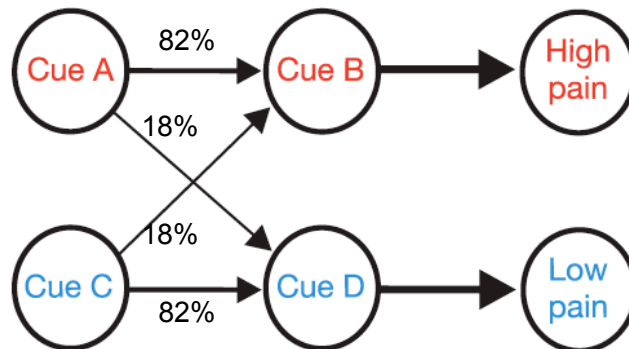

what would you expect?

2

fMRI of aversive conditioning

Theoretical predictions: TD learning

Cue A → Cue B → High pain

Cue C → Cue D → Low pain

Cue C → Cue B → High pain

Cue A → Cue D → Low pain

b Temporal difference value

c Temporal difference prediction error

· · · Before learning   ······· Mid-learning   —— Late learning

Seymour et al. (2004)   3

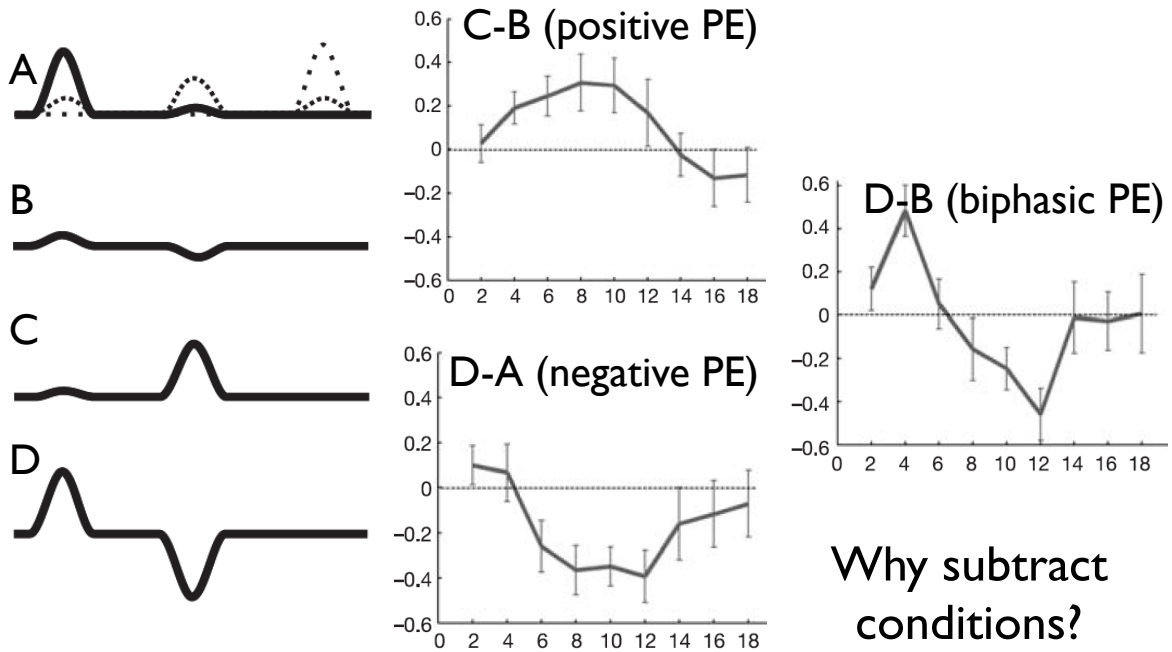# fMRI of aversive conditioning

Areas correlating with prediction error signal:
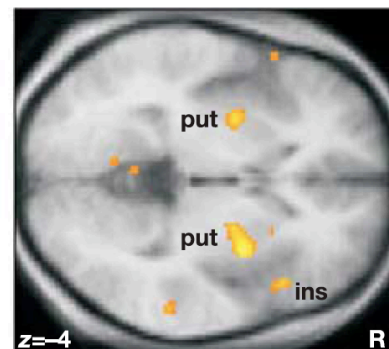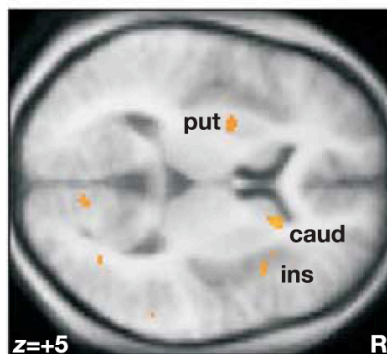
Note: this is for aversive outcomes
(striatal BOLD signal not a "pleasure" signal!)

Seymour et al. (2004)   4
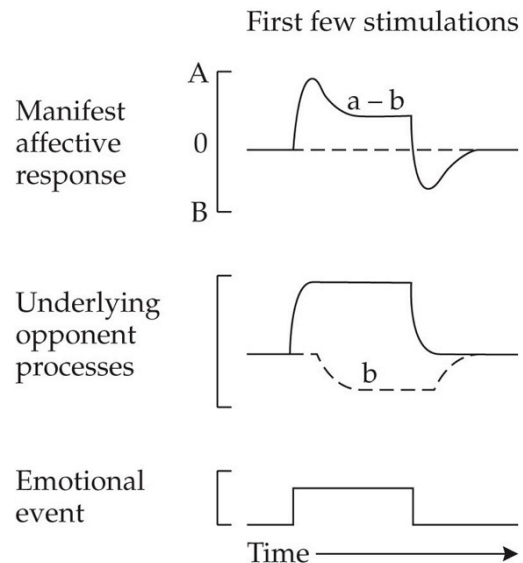
fMRI of aversive conditioning

A

B

C

D

C-B (positive PE)

D-A (negative PE)

D-B (biphasic PE)

Why subtract conditions?

Solomon & Corbit (1974): opponent process model

- idea: emotional USs elicit A state and later opposing B state that restores homeostasis (eg. morphine, amphetamines, skydiving, exam)

- A state: proximal to US, depends on its magnitude; B state: later

- only B is conditioned: becomes stronger and appears earlier, canceling A (tolerance, withdrawal)

First few stimulations

Manifest affective response

A

0

B

a – b

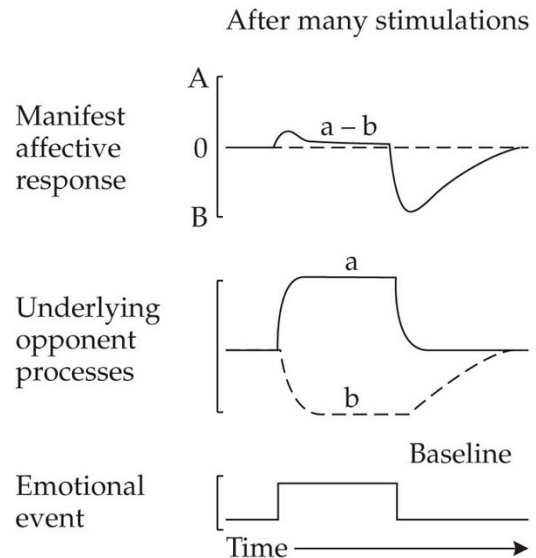Underlying opponent processes

b

Emotional event

Time

Solomon & Corbit (1974): opponent process model

- idea: emotional USs elicit A state and later opposing B state that restores homeostasis (eg. morphine, amphetamines, skydiving, exam)

- A state: proximal to US, depends on its magnitude; B state: later

- only B is conditioned: becomes stronger and appears earlier, canceling A (tolerance, withdrawal)

- explains drug addiction? (more drug to cope with aversive B state) overdosing in new contexts? (less conditioned B state)

After many stimulations

Manifest affective response

Underlying opponent processes

Emotional event

Baseline

Time

Last: uses of Pavlovian conditioning in humans

1. prevent aversion to food in patients receiving chemotherapy by eating specific candy before treatments (aversion only to candy)

2. advertising: contiguity between product and US that elicits positive emotional response, causes conditioning of CER to product

3. conditioned immunosuppression (Lupus): add strong-flavored oil to drug; then get same immune response to the oil alone