

A Social Cognitive Neuroscience Approach
to Emotion Regulation:
Implications for Substance Abuse

Kevin Ochsner

COLUMBIA UNIVERSITY
Social/Cognitive/Affective/Neuroscience Unit

Research supported by NIDA, NIH, NSF

Our Research Village

Tor Wager



Carl Hart



Walter Mischel



Columbia
(present)

Hedy Kober Brent Hughes



Ethan Kross



Matthew Davidson



James Gross



John Gabrieli



Becky Ray



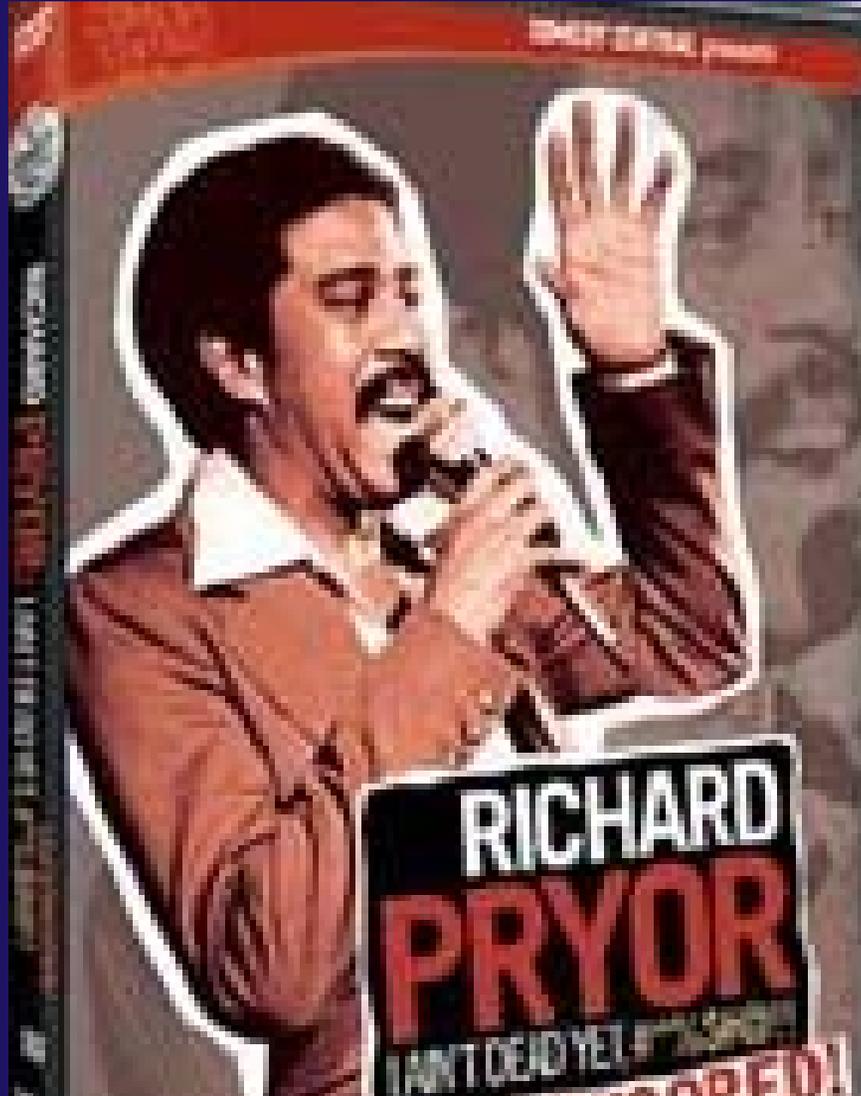
Elaine Robertson



Jeff Cooper



Stanford
(past)



How could he have controlled his substance-abusing impulses?

Affect Regulation & Substance Abuse

1. Describe research that builds a model of the brain bases of effective emotion regulation
2. Consider how this model might be translated to help understand mechanisms of substance abuse & its treatment

1. Mechanisms of Emotion Regulation

If you are distressed by anything external, the pain is not due to the thing itself, but to your estimate of it; and this you have the power to revoke at any moment.

-Marcus Aurelius



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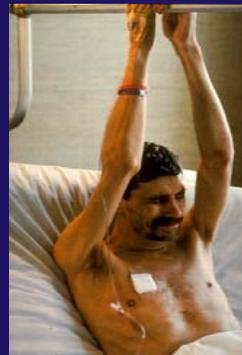
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Typical Design for Studying **Re**-appraisal

REAPPRAISE
or
LOOK



Strength of
Affect

weak strong
1 2 3 4 5

RELAX

Instructional
cue

Photo
period

Affect
rating

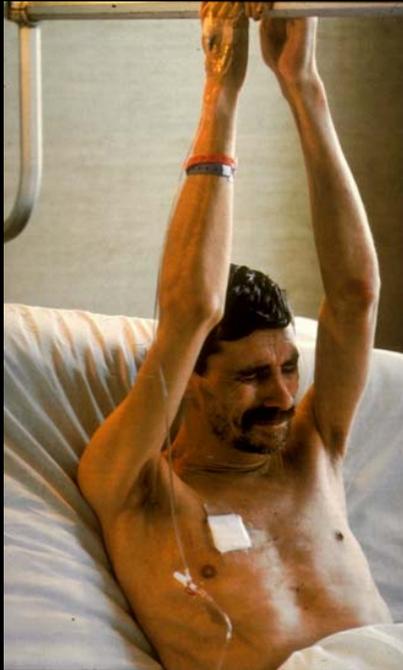
Intertrial
interval

2 secs

10 secs

~4 secs

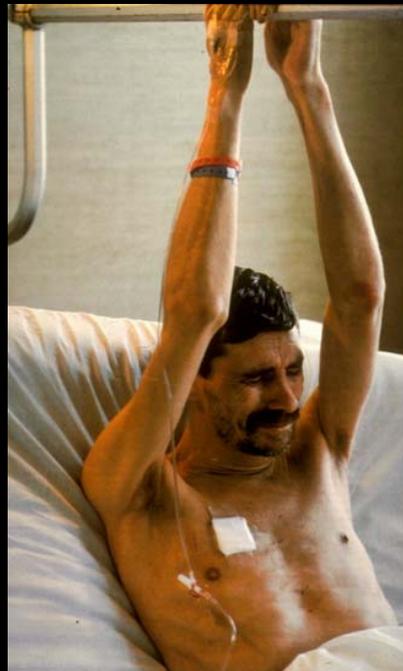
~4-5 secs



Think about image in a way that makes you feel more neg....

Increase Negative Affect

“He’s in pain, is weak of heart, may die soon....”



Think about image in way that makes you feel less negative....

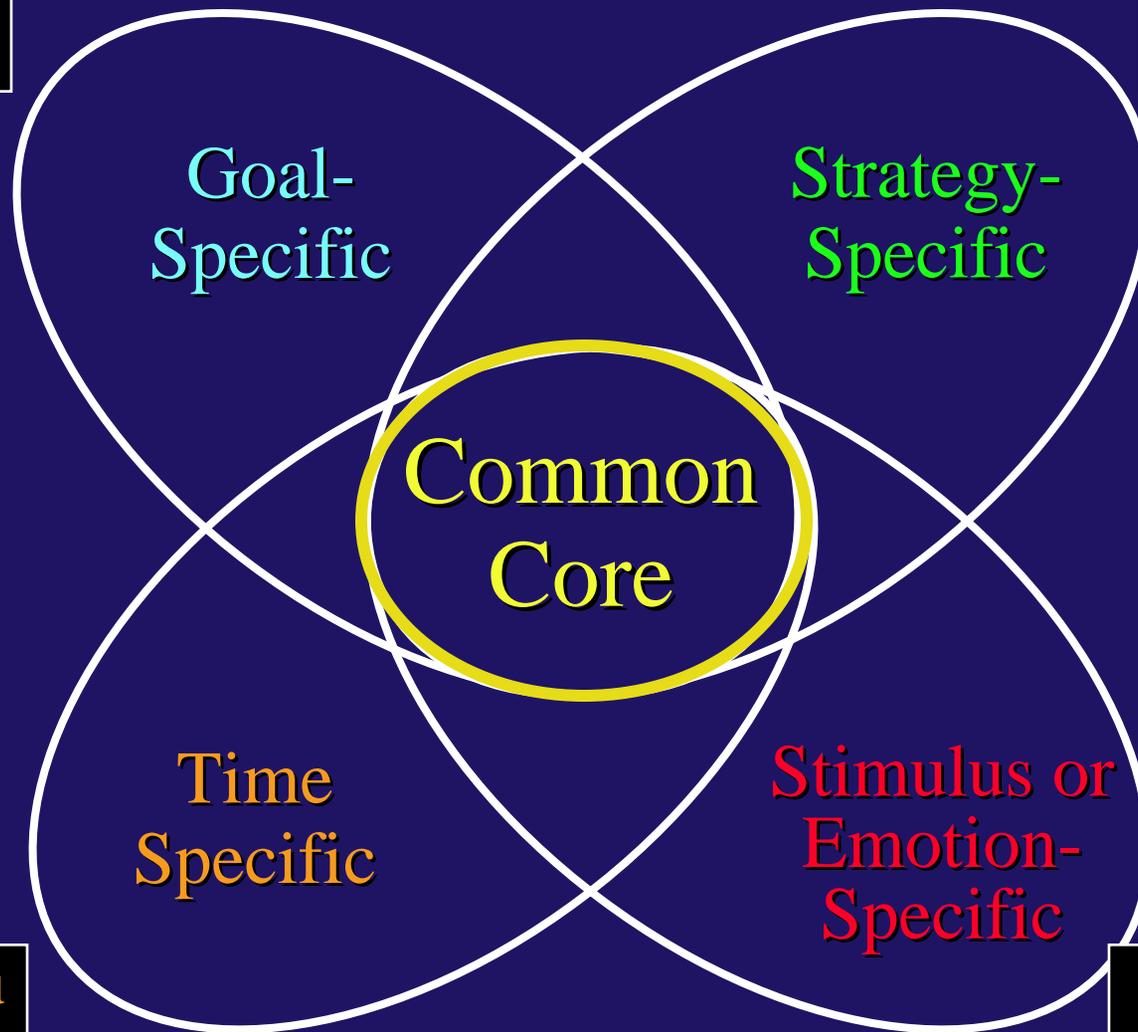
Decrease Negative Affect

“He’s just tired/annoyed, is hearty, will be right as rain....”

Building the Model

1. Why you reappraise

2. How you reappraise



4. When you reappraise

3. What you reappraise

Building the Model

1. Why you reappraise

2. How you reappraise

Two goals:
Negative Affect ↑
↓

Strategy-Specific

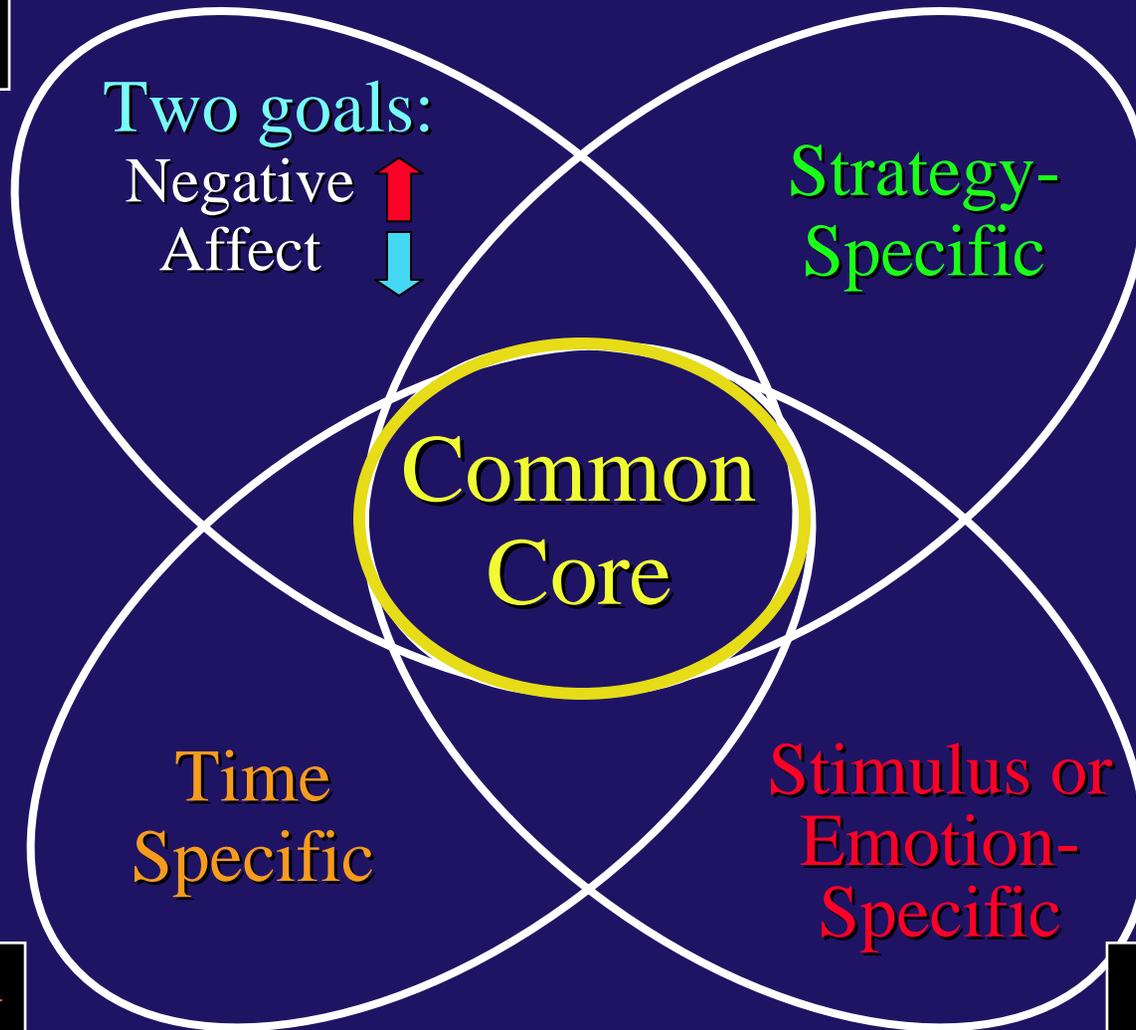
Common Core

Time Specific

Stimulus or Emotion-Specific

4. When you reappraise

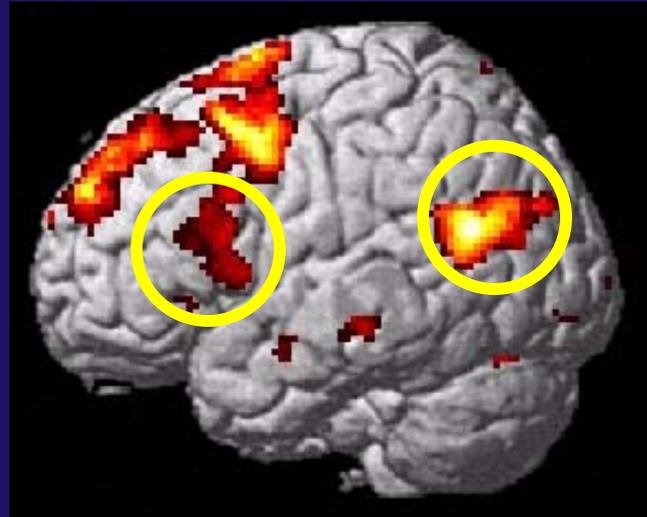
3. What you reappraise



Common PFC regions for each reappraisal Goal

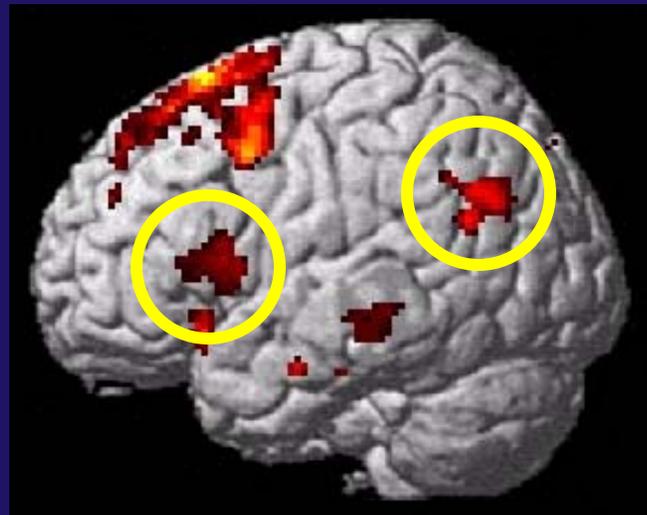
Ochsner, Ray, Robertson, Cooper, Gabrieli & Gross (2004)

Increasing
Neg Affect
(Increase > Look)

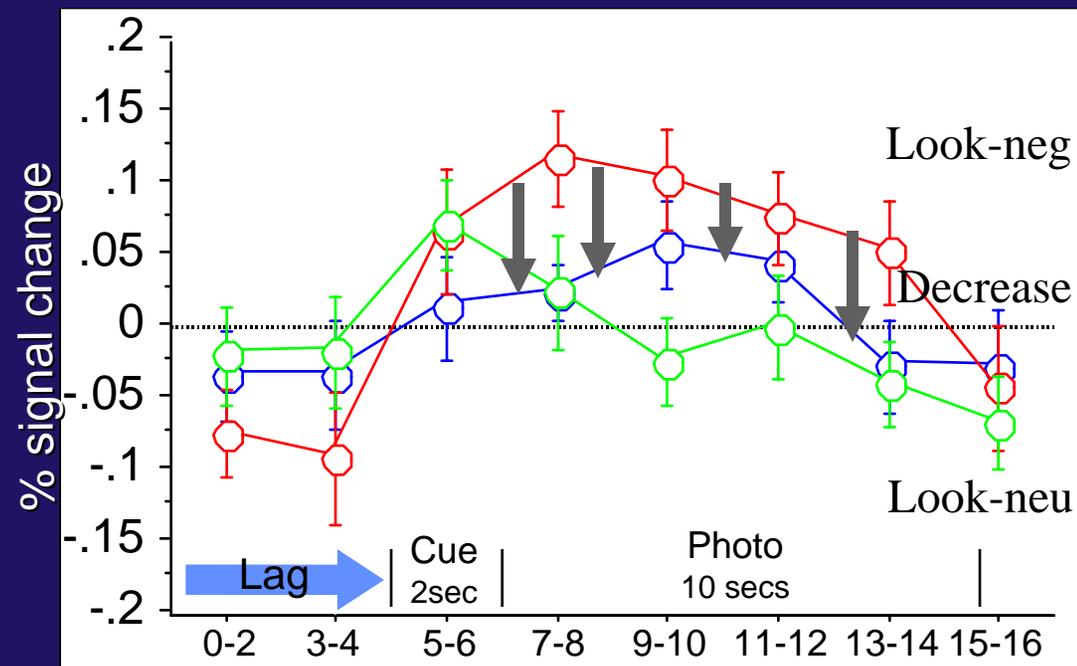
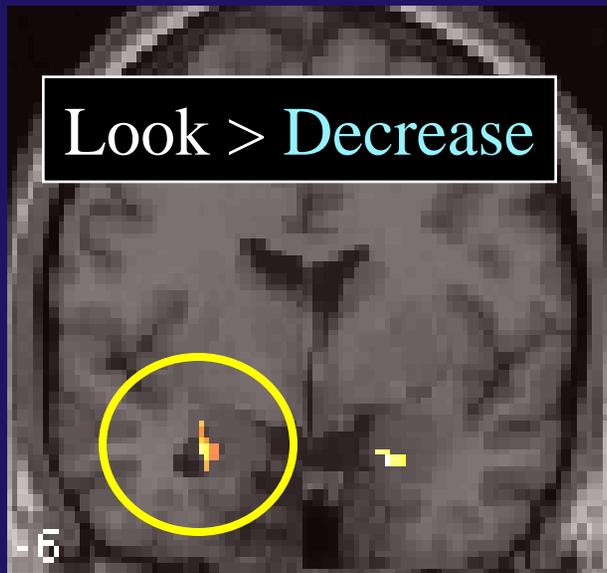
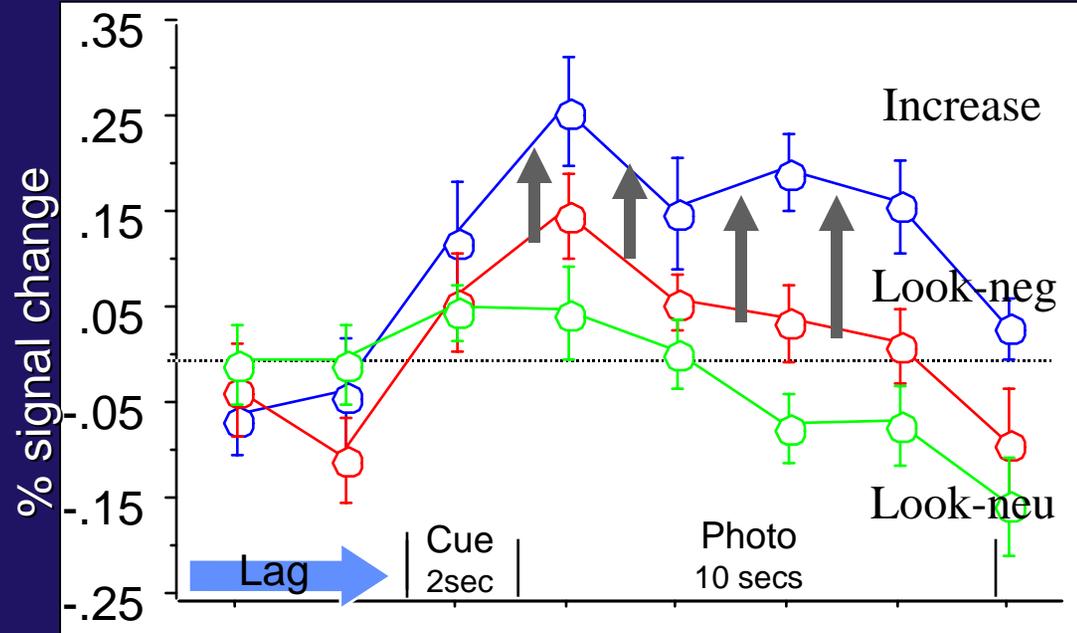


Lateral PFC

Decreasing
Neg Affect
(Decrease > Look)



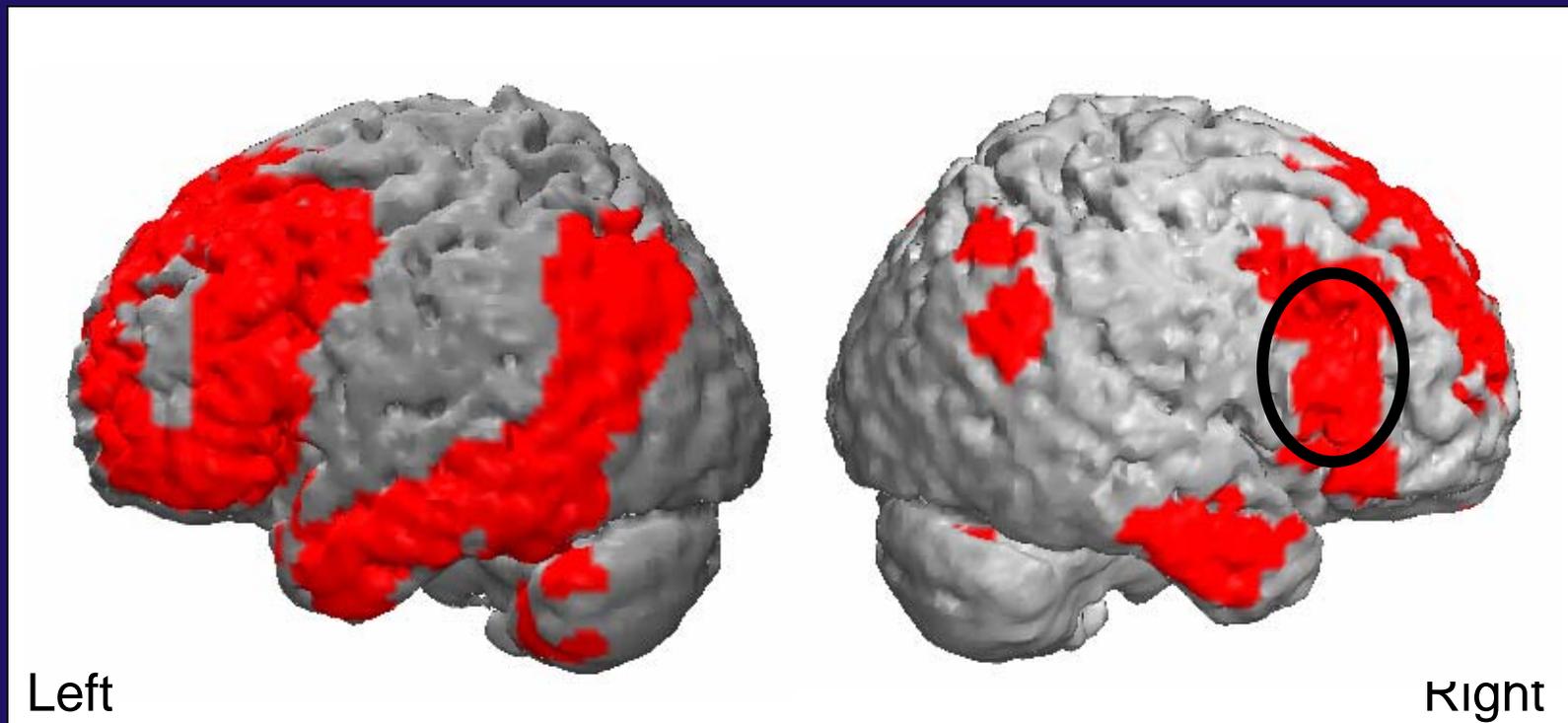
Amygdala modulated up or down in accord with reappraisal goal



Bilateral Activation for Decreasing Neg Affect

Wager, Ochsner, Hughes & Davidson (*in prep*)

WM / Language / Response Selection regions



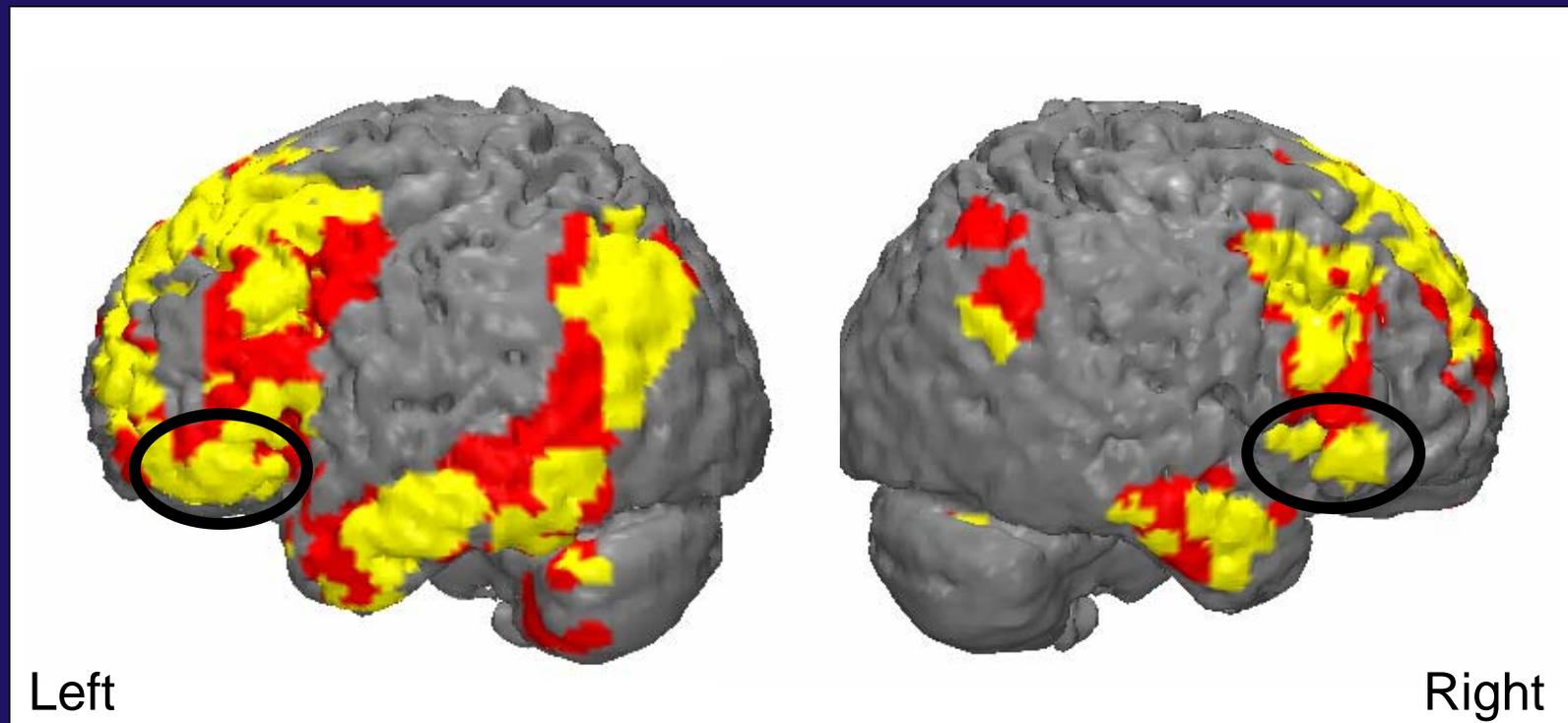
Decrease > Look

N = 34, optimized

Bilateral Activation for Decreasing Neg Affect

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Activity in many regions correlates with **Reappraisal Success**



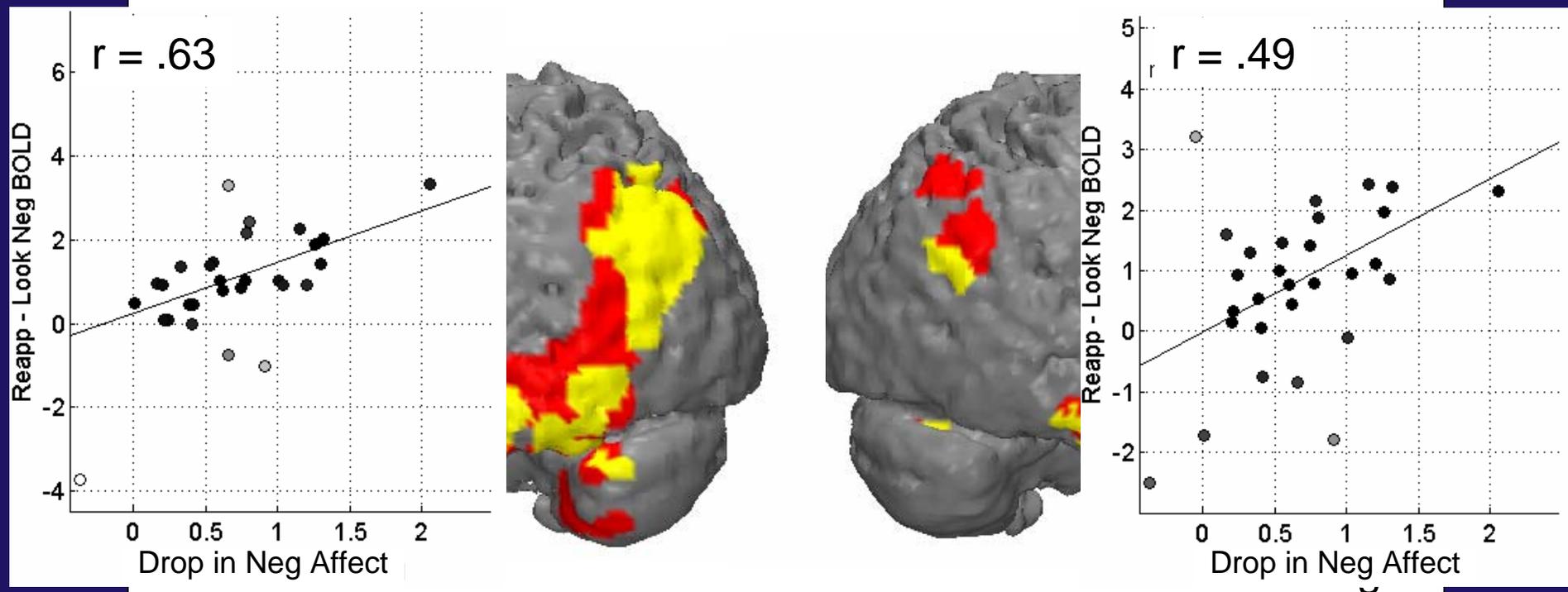
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Bilateral Activation for Decreasing Neg Affect

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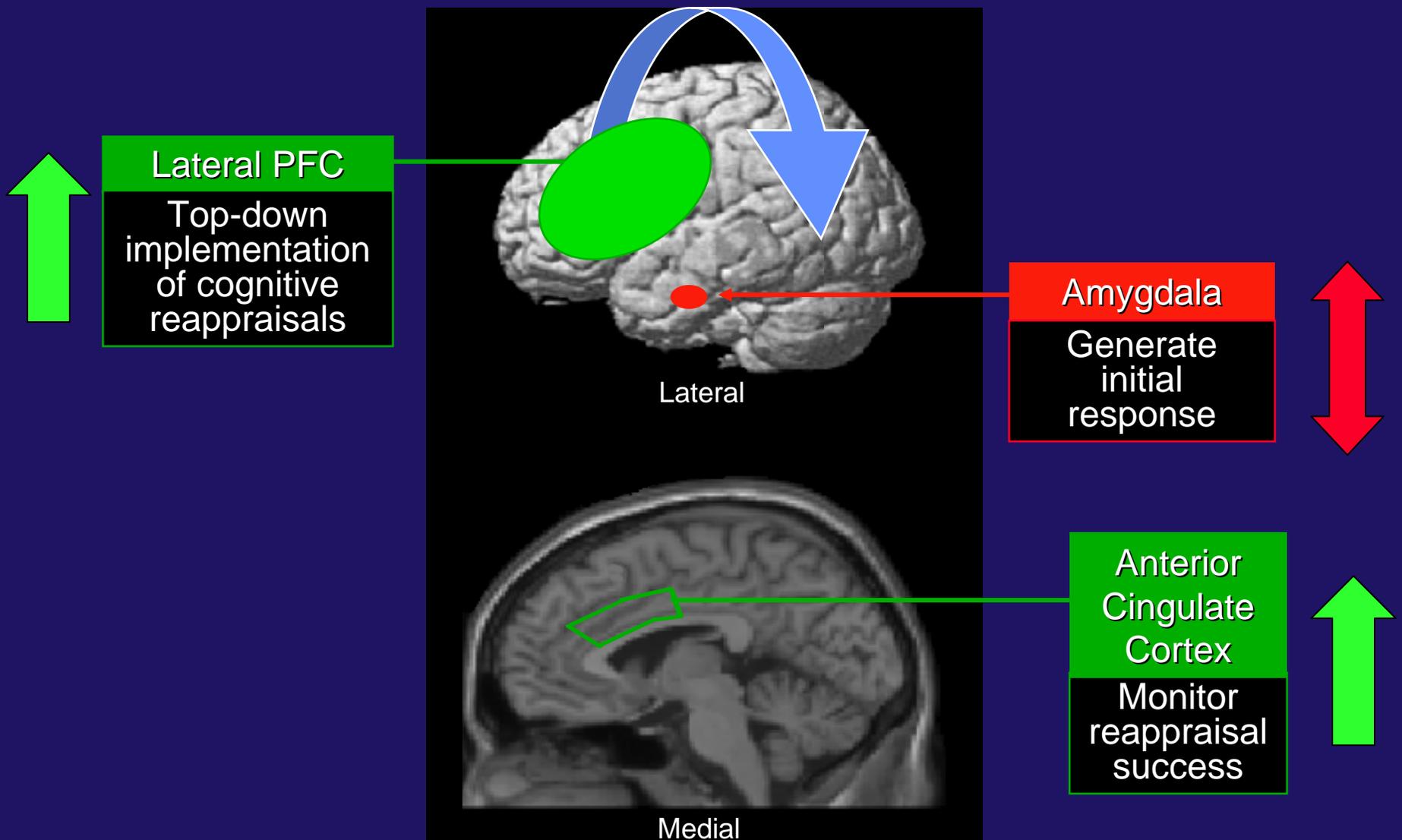


Decrease > Look

N = 34, optimized

Core Prefrontal-Amygdala interactions Underlying the Cognitive Control of Emotion

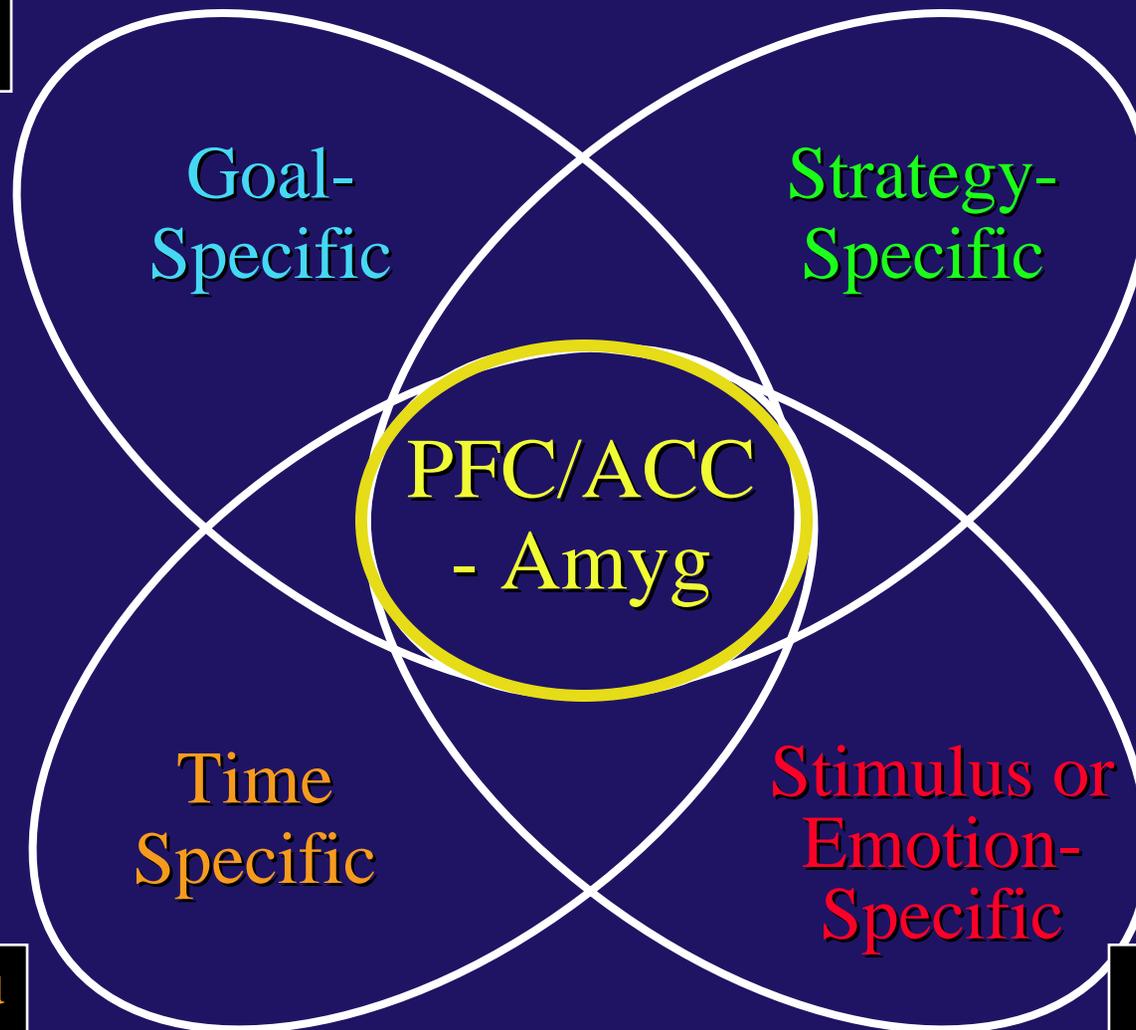
(Ochsner, in press; Ochsner & Gross, 2004, 2005, in press; cf. Beer et al, 2004; Lieberman et al, 2005)



Building the Model

1. Why you reappraise

2. How you reappraise



4. When you reappraise

3. What you reappraise

Building the Model

1. Why you reappraise

Ochsner et al, 2002, 2004;
Wager, Ochsner et al, *in prep*

2. How you reappraise

DMPFC ↑

Right LPFC ↓

Strategy-Specific

PFC/ACC
- Amyg

Time Specific

Stimulus or Emotion-Specific

4. When you reappraise

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Building the Model

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Ochsner et al, 2002, 2004;
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DMPFC ↑
Right LPFC ↓

2. How you reappraise

Ochsner et al, 2004

Medial PFC
for self-
focused strats

PFC/ACC
- Amyg

Time
Specific

Stimulus or
Emotion-
Specific

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Ochsner et al, 2004

Medial PFC
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PFC/ACC
- Amyg

Time
Specific

Left PFC for
memories, like
images

Kross &
Ochsner *in prep*

4. When you reappraise

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Building the Model

1. Why you reappraise

Ochsner et al, 2002, 2004;
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DMPFC ↑
Right LPFC ↓

2. How you reappraise

Ochsner et al, 2004

Medial PFC
for self-
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PFC/ACC
- Amyg

Wager, Ochsner et al, *in prep*

Pre-appraisal =
LPFC, like
Reapp

Left PFC for
memories, like
images

Kross & Ochsner *in prep*

4. When you reappraise

3. What you reappraise

Building the Model

1. Why you reappraise

Ochsner et al, 2002, 2004;
Wager, Ochsner et al, in prep

5. Who reappraises

Ray, Ochsner et al, 2006

Wager, Ochsner et al, *in prep*

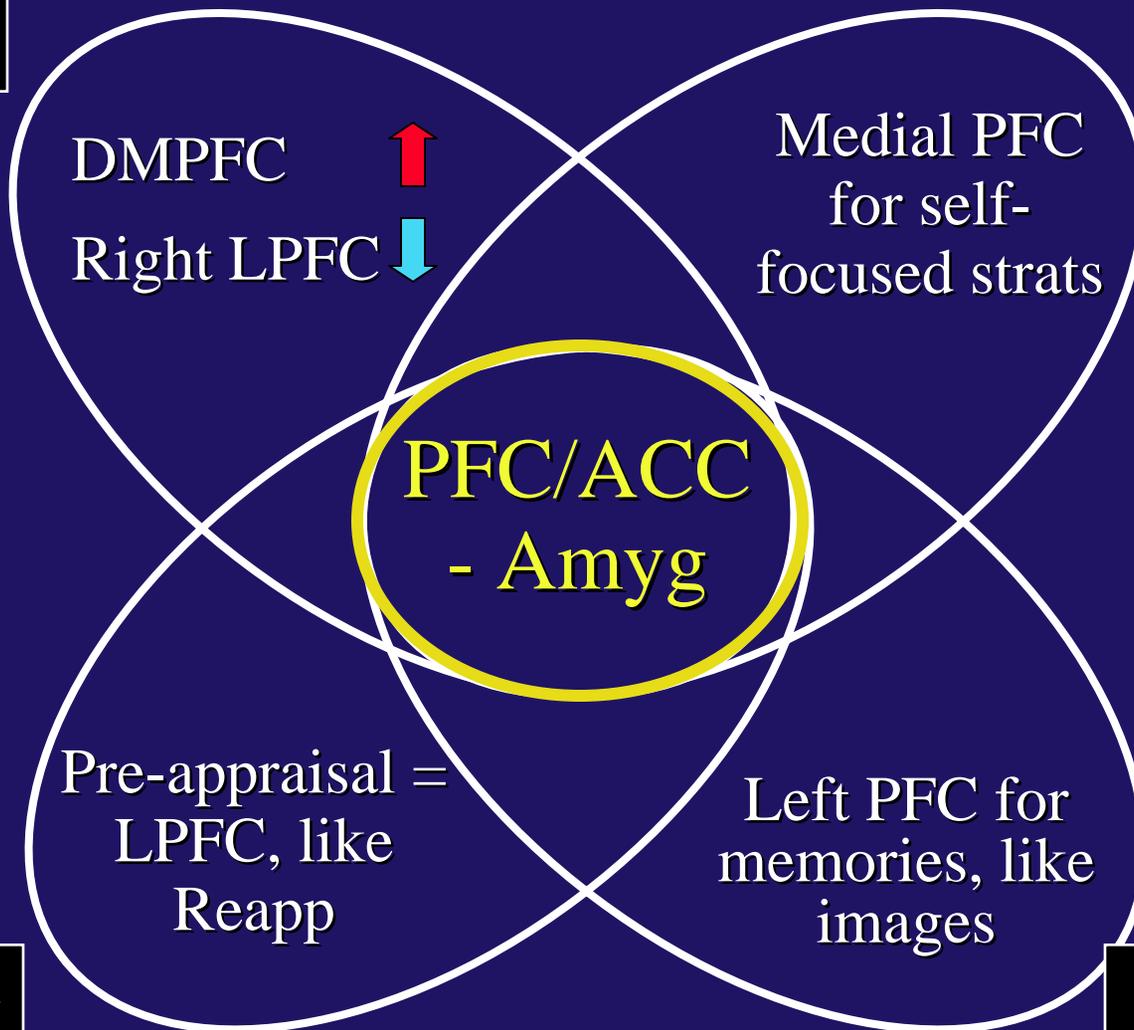
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Ochsner et al, 2004

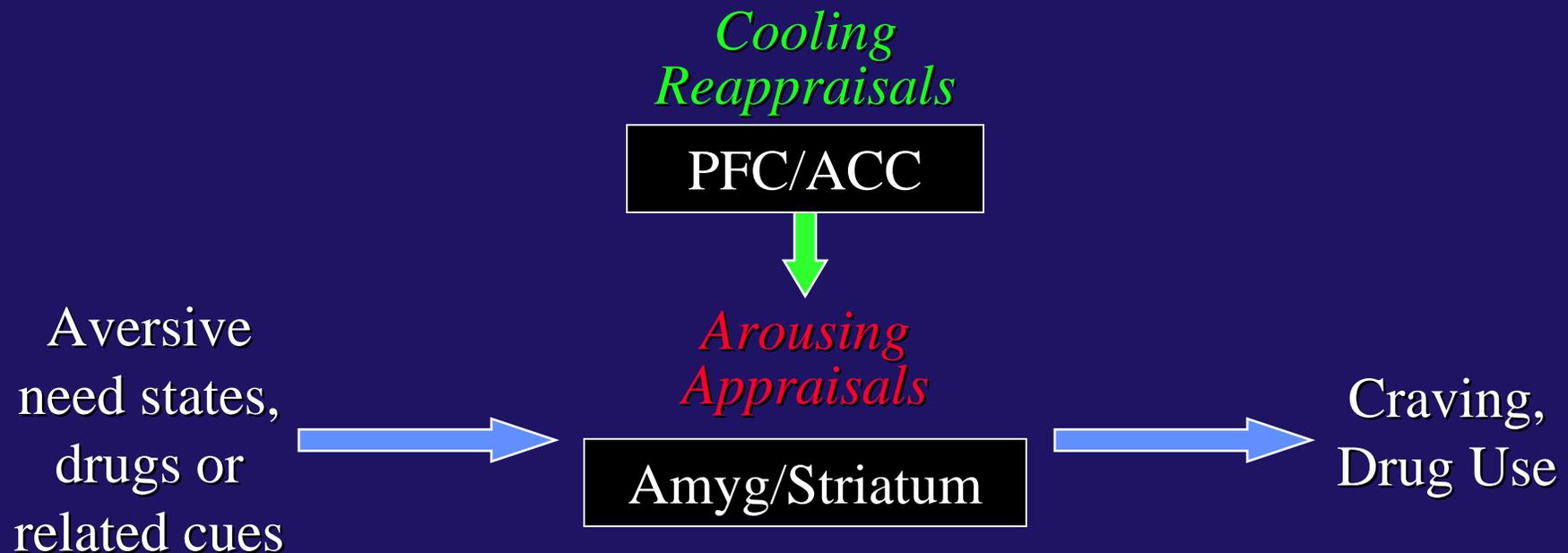
Kross & Ochsner *in prep*

3. What you reappraise



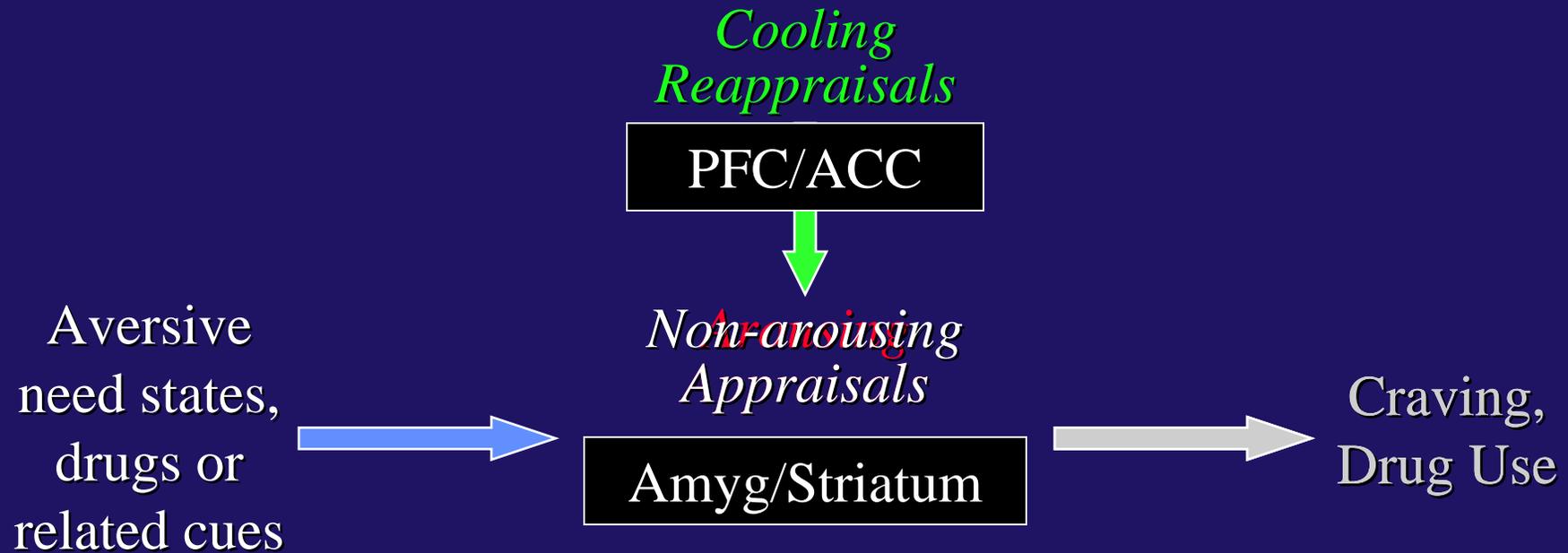
2. Translating the Model

How does affect regulation play a role in substance abuse?



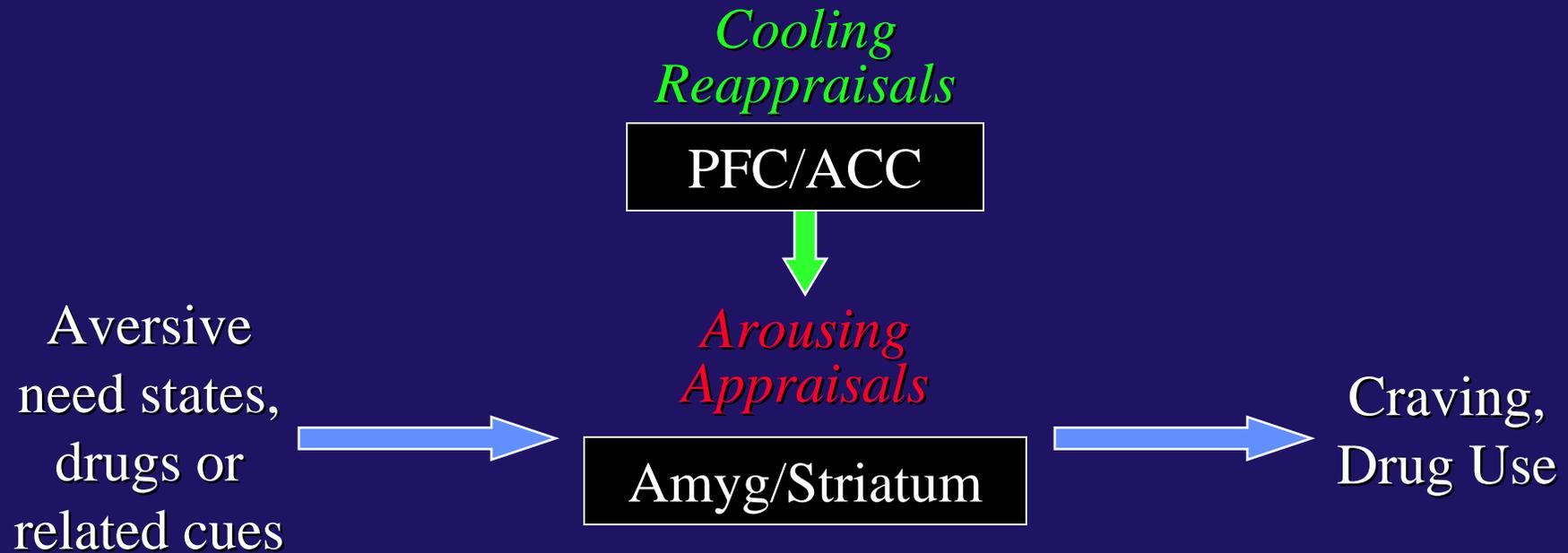
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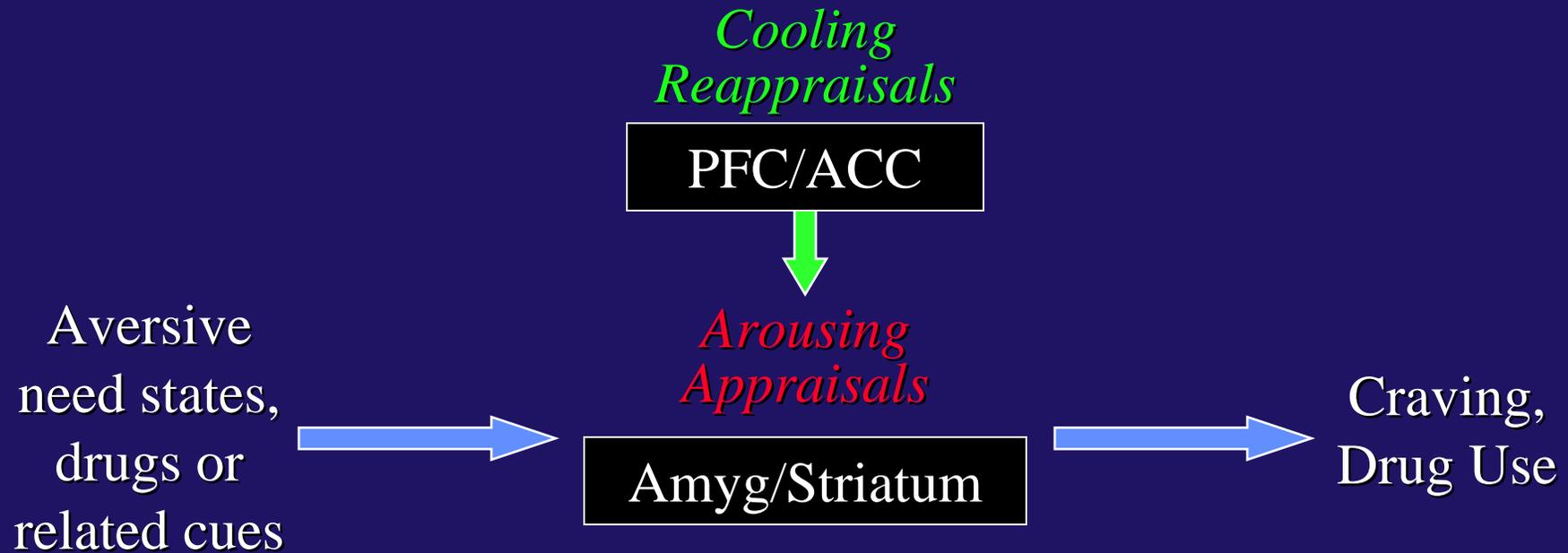
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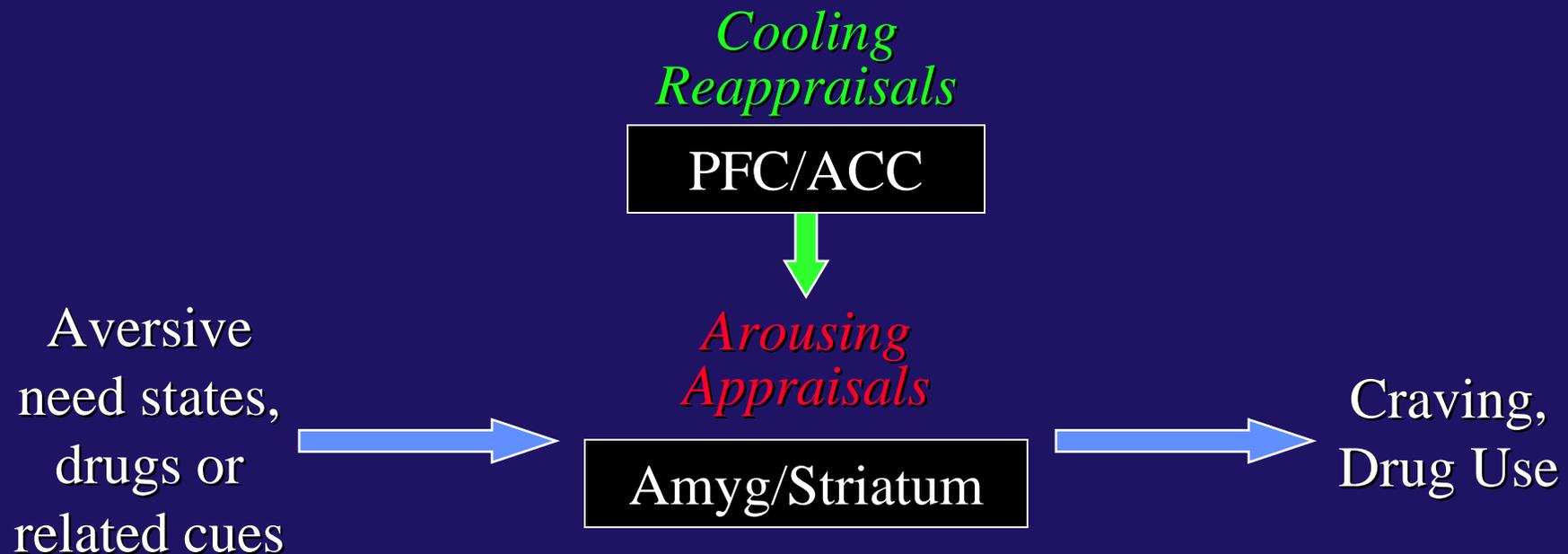
2. Translating the Model

How does affect regulation play a role in substance abuse?



2. Translating the Model

How does affect regulation play a role in substance abuse?



1. Drugs and drug cues “turn on” affective circuits (e.g. Breiter et al.; Grant et al.; Volkow et al.)
2. Long term use may damage control circuits (e.g. London et al.; Nordahl et al.)
3. Drug users have self-regulatory deficits
 - Childhood deficits predispose towards drug use (e.g. Mischel et al.)
 - Deficits in lab tasks following drug use (e.g. Garavan & Stout)

The Translational Future

A 2-step, translational social cognitive neuroscience approach to emotion regulation may be useful for understanding substance abuse.....

Q: But will it be successful?

A: Yes.

1. Extant work has characterized cognitive and structural neural deficits, but has not examined socioemotional functions and the ability to regulate *per se*, which is central to treatment
2. Can show how specific regulatory mechanisms are dysfunctional – or effective – which may be useful for designing treatments that target them
3. The same 2-step process already has been successful in applying Cog Neuro models of memory and attention to Mood Disorders, Schizophrenia, and substance abuse

If you ~~desires~~ anything external, the ~~urge~~ is that ~~due~~ to the thing itself, but to itself, ~~estimate~~ of it, ~~stand~~ at this you have the power to ~~revoke~~ at any ~~moment~~ any moment.

- Marcus Aurelius

