

The Human Mind Conference

Emotions and Subjective Perspective

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Aim

- A Synthetic Account providing a *framework* for understanding and integrating work on emotions ranging from the molecular and neural to the personal and social.
- Helps answer the conference question: **How do the psychological and neural mechanisms of emotions underlie the subject's point of view on the world?**
- **Short answer: they tell us not just how the world is, but how it matters**
- **And allow us to feel that significance in the form of affect**
- **they create a form of affective self representation. Subtly different from bodily/minimal self representation.**

What can we agree about ?

- Emotional Episodes have components
- Appraisal (evaluation of the elicitor is *relevance* to organismic goals) This is why emotions have **formal objects or themes**: they are given by the goals.
- Autonomic Physiology
- Action tendencies
- Motor expression
- Subjective feeling (AFFECT)

What do people the disagree about?

- Not the what. The HOW. Whether affect behaviour low or high level processes drive/primarily explain episodes of emotion

Theories?

- Core Affect theory
- Intentional Affect theory (Goldie)
- James Lange Damasio Prinz SOMATIC theory
- Extreme Cognitivism (Nussbaum Solomon)
- Basic Emotion (Ekman Panksepp)
- Complicated Basic Emotion (Griffiths)
- EmbodiedPredictiveInteroceptiveCoding(Feldman Barrett)
- Appraisal (Lazarus)
- Multicomponential Appraisal (Sander, Scherer)
- Dynamic/Interactive/Enactive (Colombetti)
- *The claim* cognitive neuroscience *properly interpreted* (?!) helps diagnose and resolve these debates

General i.e. nature of neural computation applied to emotion

- the mind is basically a neurally-implemented hierarchical array of predictive models whose role is regulatory. *i.e. minimising prediction error in the context of behaving adaptively*
- Problems are resolved at the *lowest level possible* by the model (i.e. mental representation) which *fits best*. When model fits the emotional response *stabilises*
- Not *a priori* that stability=proportionality, veridicality, *etc*

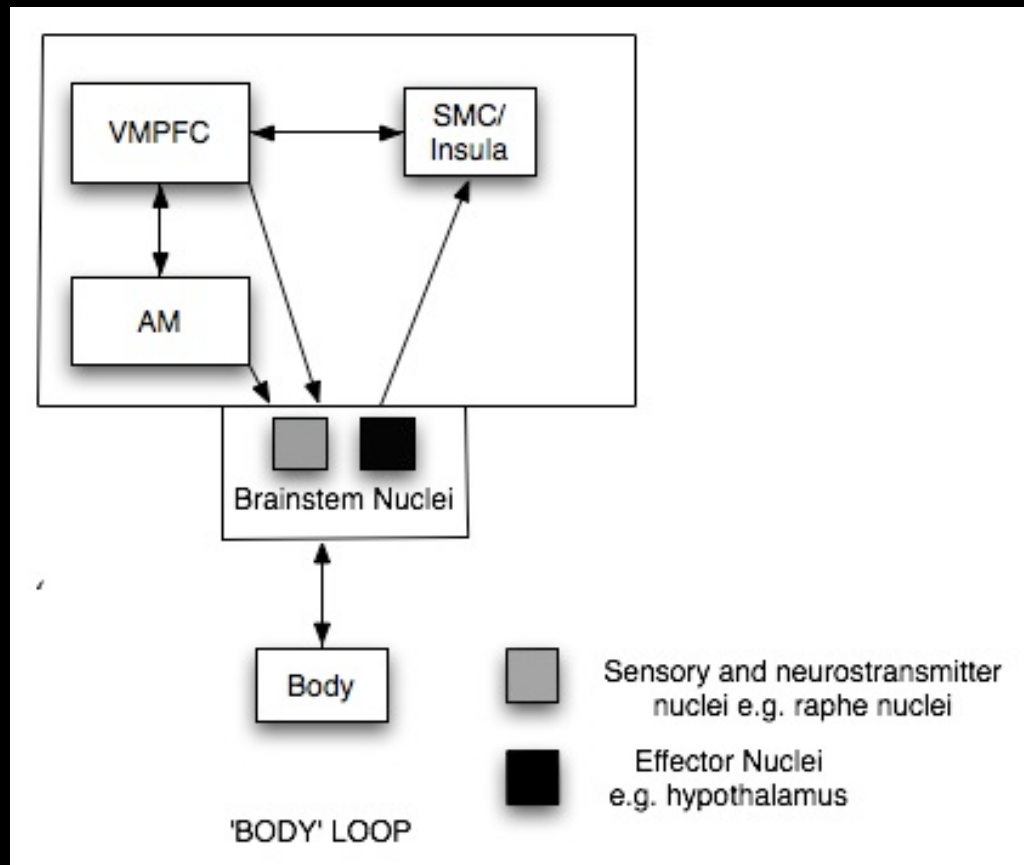
emotional processing: how?

- Emotional systems coordinate other perceptual/inferential systems to the task of determining **self relevance** and setting up responses which are felt through the body in characteristic ways
- Cognition represents the world (including states of our bodies)
- Emotional processes tell us the significance of that information
- Affects allow us to feel that significance in the context of decision and learning.

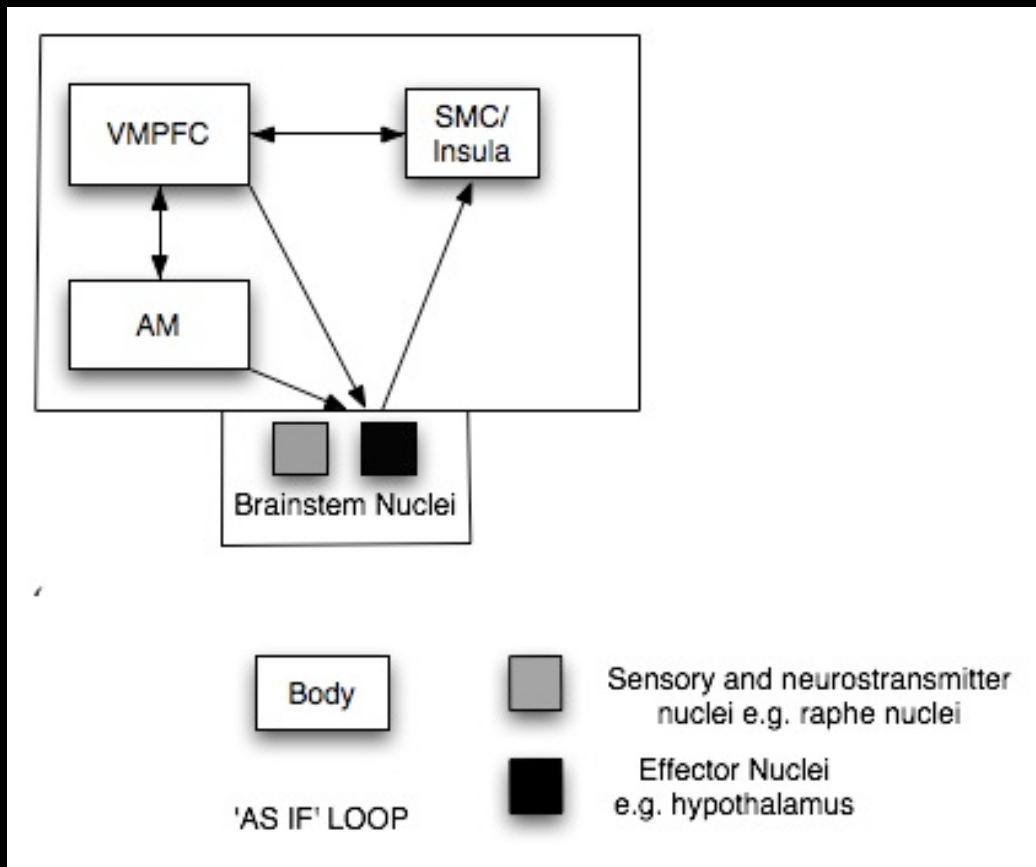
Nature of Appraisal

- Hierarchical
- Initially fast, amygdala driven, *subcortical* organisation of emotion components.
- At longer time scales slower, more reflective, prefrontal (esp vmppfc) driven organisation of emotion components
- vmppfc recapitulates amygdala role at higher level
- Reflects general cognitive facts about progressively higher level integration abstraction metacognition both within and between domains

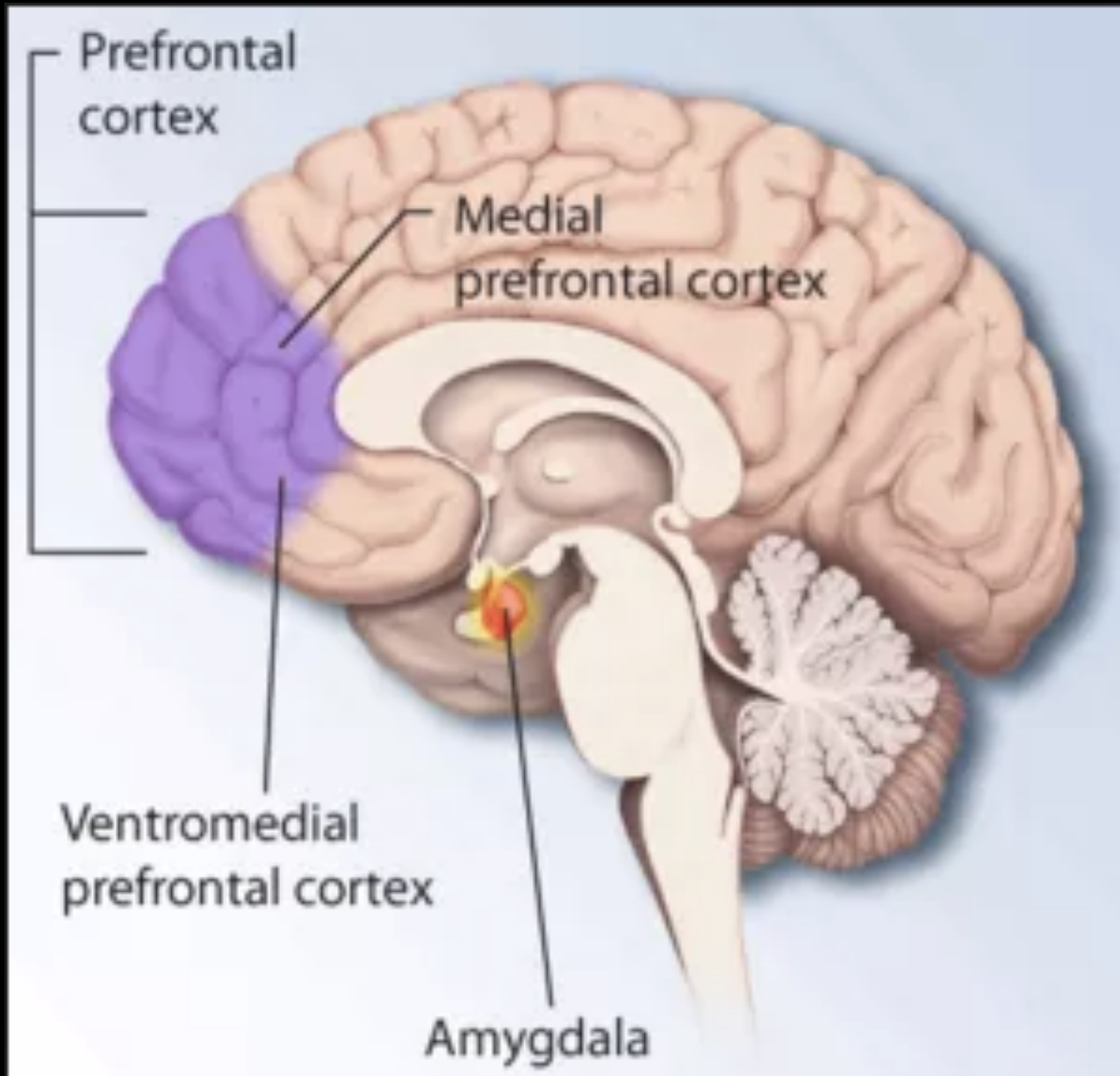
Online somatic system



Offline somatic system



Appraisal hubs



Insula

- The convergence of multimodal sensory information and ability to readout subjective states (Craig 2009; Ullsperger et al. 2010) likely explains why the insula is intimately involved in ***affective processing*** (Damasio et al. 2000; Wager and Feldman- Barrett 2004).
- Affective processing is functionally important for detecting salient information and signaling the recruitment of additional attentional resources and cognitive control. Thus, the insula is also well suited to ***interface between physiological sensations and higher order cognitive systems*** and in accordance with this conceptualization has routinely been implicated in a variety of cognitive processes (Duncan and Owen 2000; Dosenbach et al. 2006; Eckert et al. 2009; Van Snellenberg and Wager 2009; Yarkoni et al. 2009). In fact, the ***insula has been demonstrated to be functionally connected with the anterior cingulate, amygdala, and VTA to form a “salience detection” network*** (Seeley et al. 2007) and appears to be integrally involved in switching between the executive control and default networks
- It allows us to **feel how things matter in the form of affects**

Active Inference Hypothesis Model of SAD Symptomatology

Sensory  Information

Implicit

Primary Appraisal	
Analysis & Interpretation	Categorization Mentalization
Relevance Detection	Social, Biological Motivation

Active Inference



Intermediate Appraisal	
Inhibition	Em. Regulation Affect Inhibition
Preparation	Salience Apprsal Contextualization

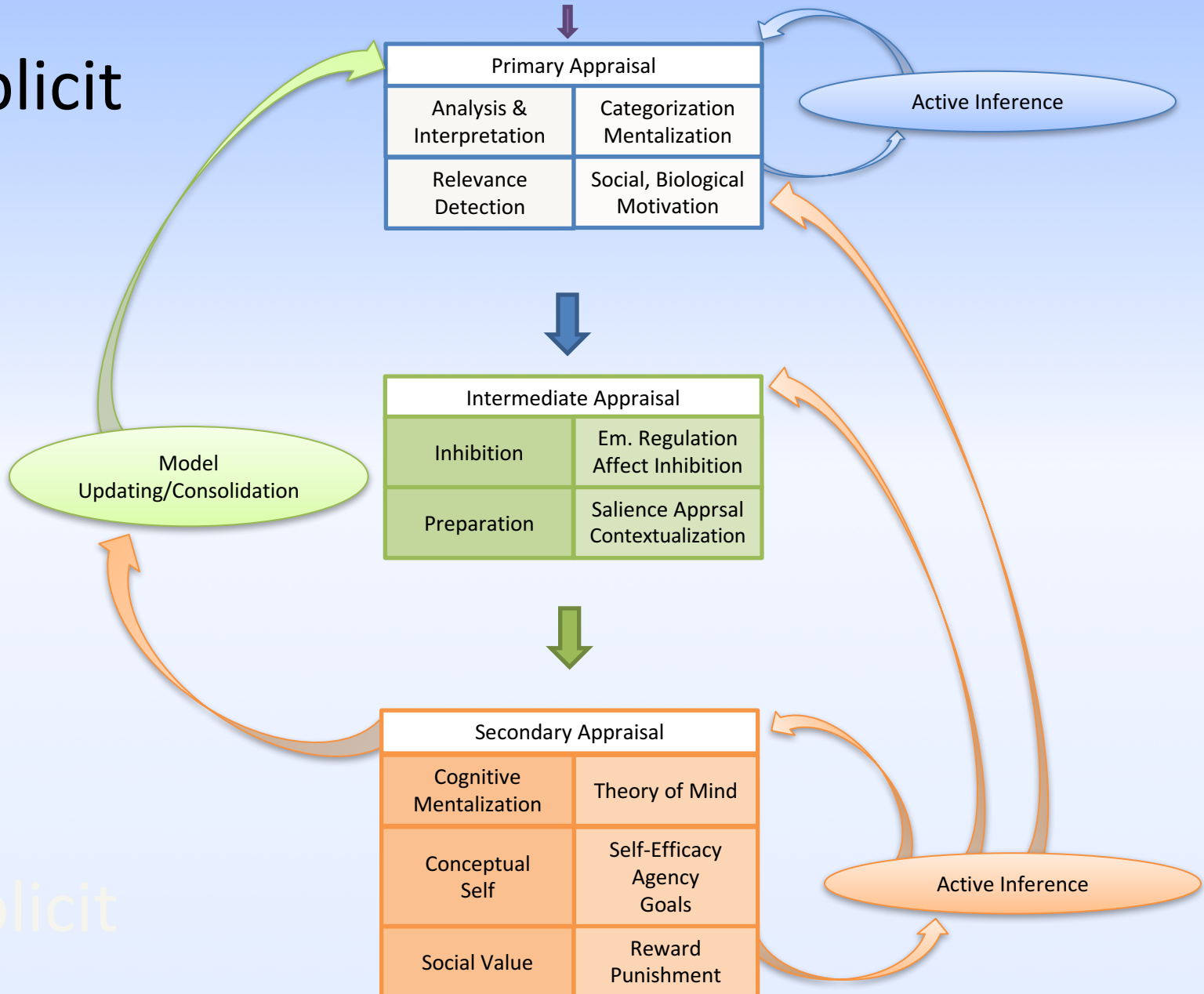


Secondary Appraisal	
Cognitive Mentalization	Theory of Mind
Conceptual Self	Self-Efficacy Agency Goals
Social Value	Reward Punishment

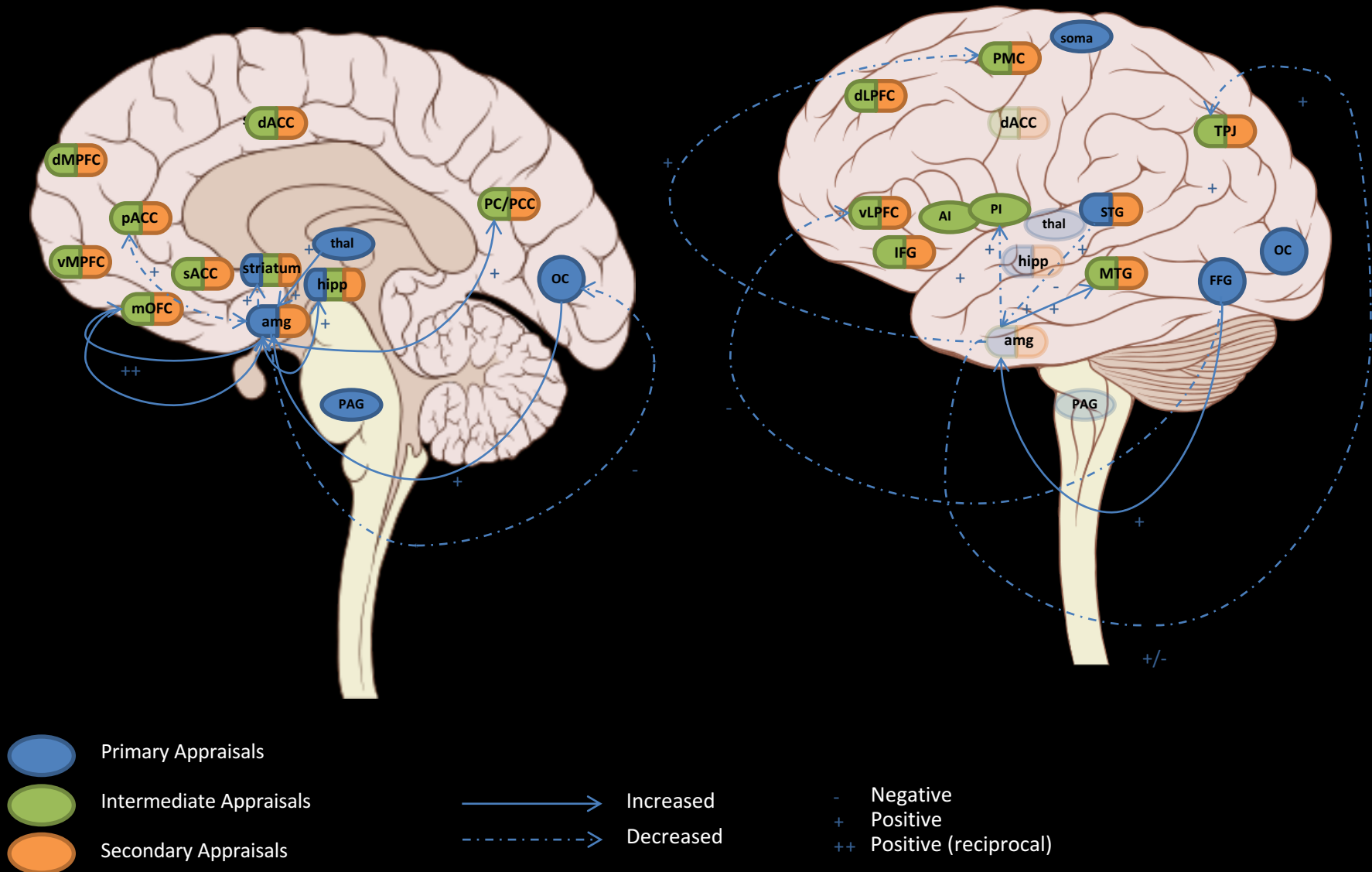
Active Inference

Model
Updating/Consolidation

Explicit



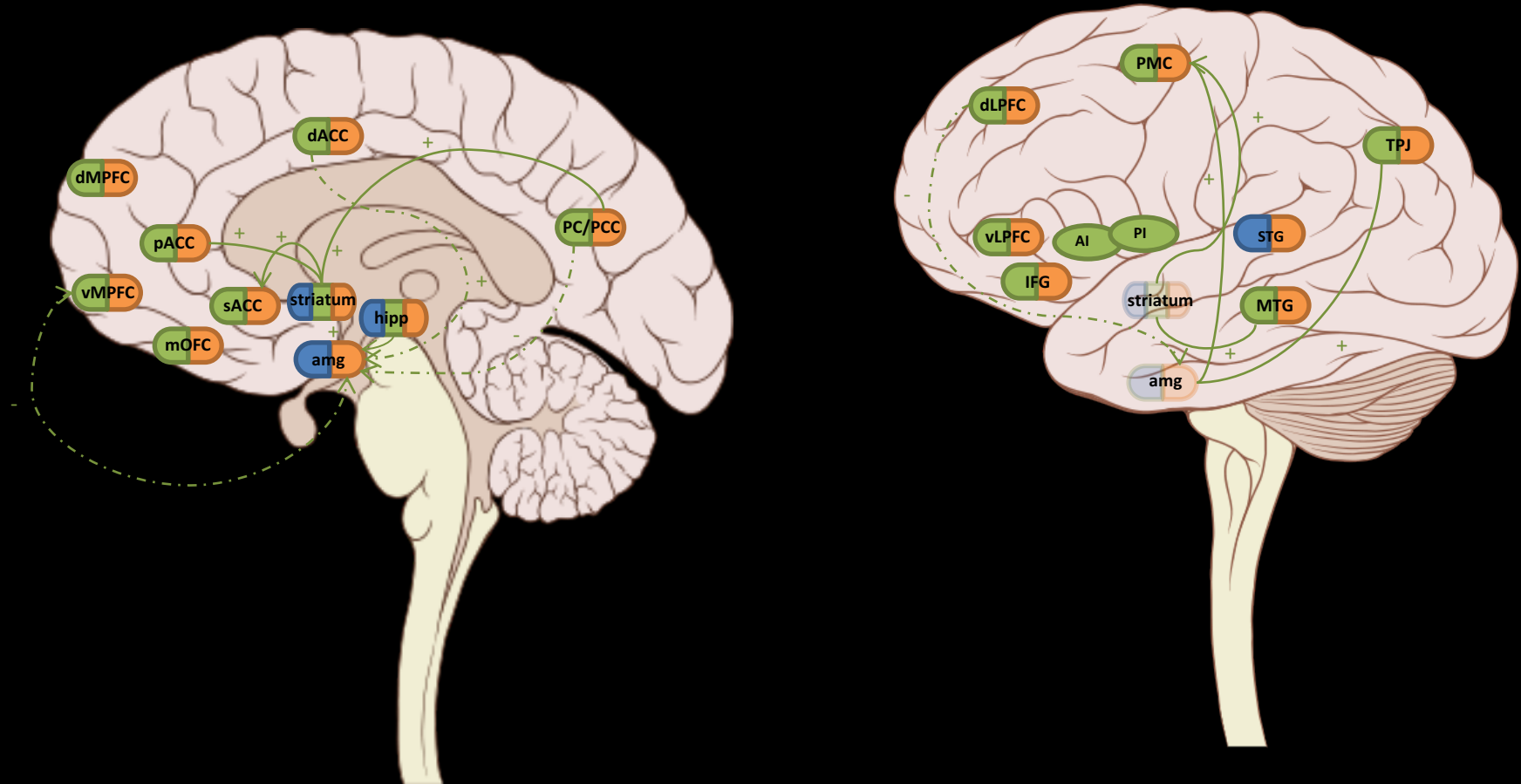
Amygdala
Primary SAD Appraisal Network
Resting-State Functional Connectivity



All

Intermediate SAD Appraisal Regions

Resting-State Functional Connectivity



- Primary Appraisals
- Intermediate Appraisals
- Secondary Appraisals

- Increased
- - - - -> Decreased

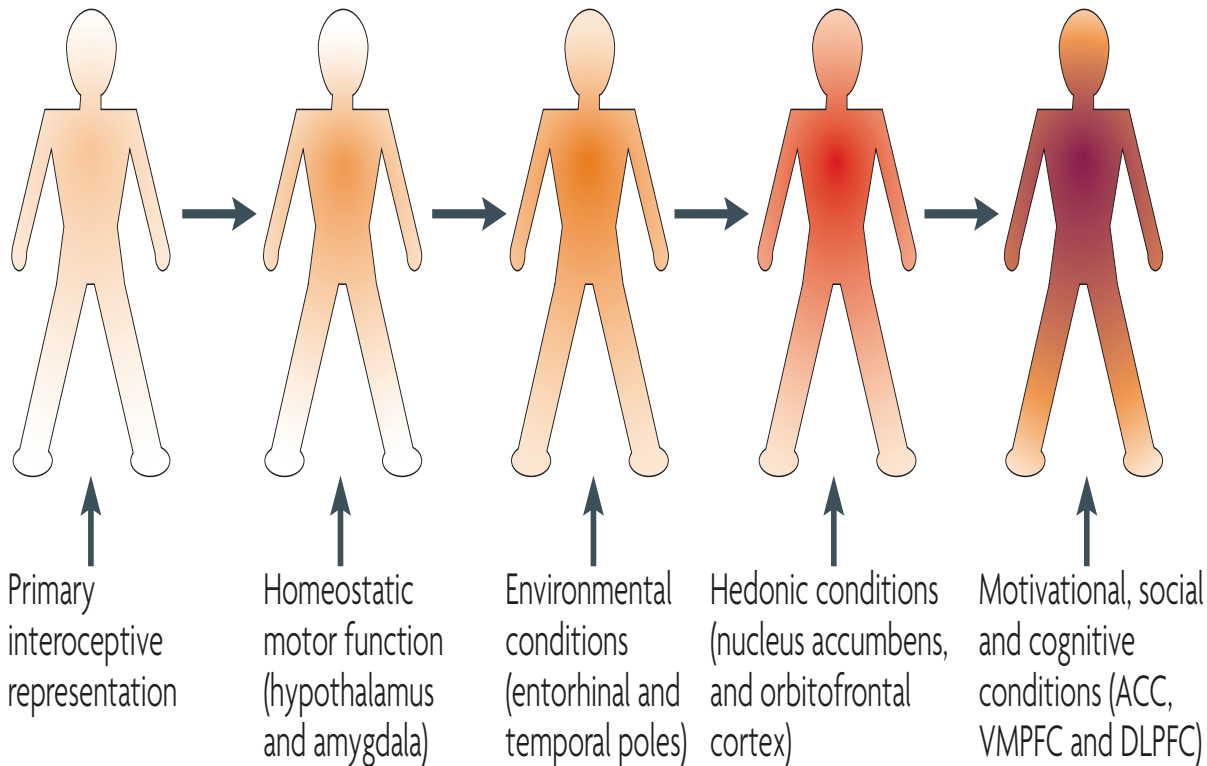
- Negative
- + Positive
- ++ Positive (reciprocal)

Bud Craig. NeuroKantian(2)

a

Posterior insula

Anterior insula



Insufficiently noticed consequence of this architecture

- Affective feelings and the self model they give rise to are *dissociable from pure bodily sensations*.
- Dramatic case: pain without affective response
- Adaptation for secondary appraisal

Feelings in reflective appraisal

- Secondary appraisal is about higher level interpretation, foresight, reflection
- We don't need to feel the *actual sensation*. That would be maladaptive (and impossible)
- We need to be able to *feel its significance*
- This is why the AIC, not PIC is active in imaginative rehearsal/simulation of self referential scenarios

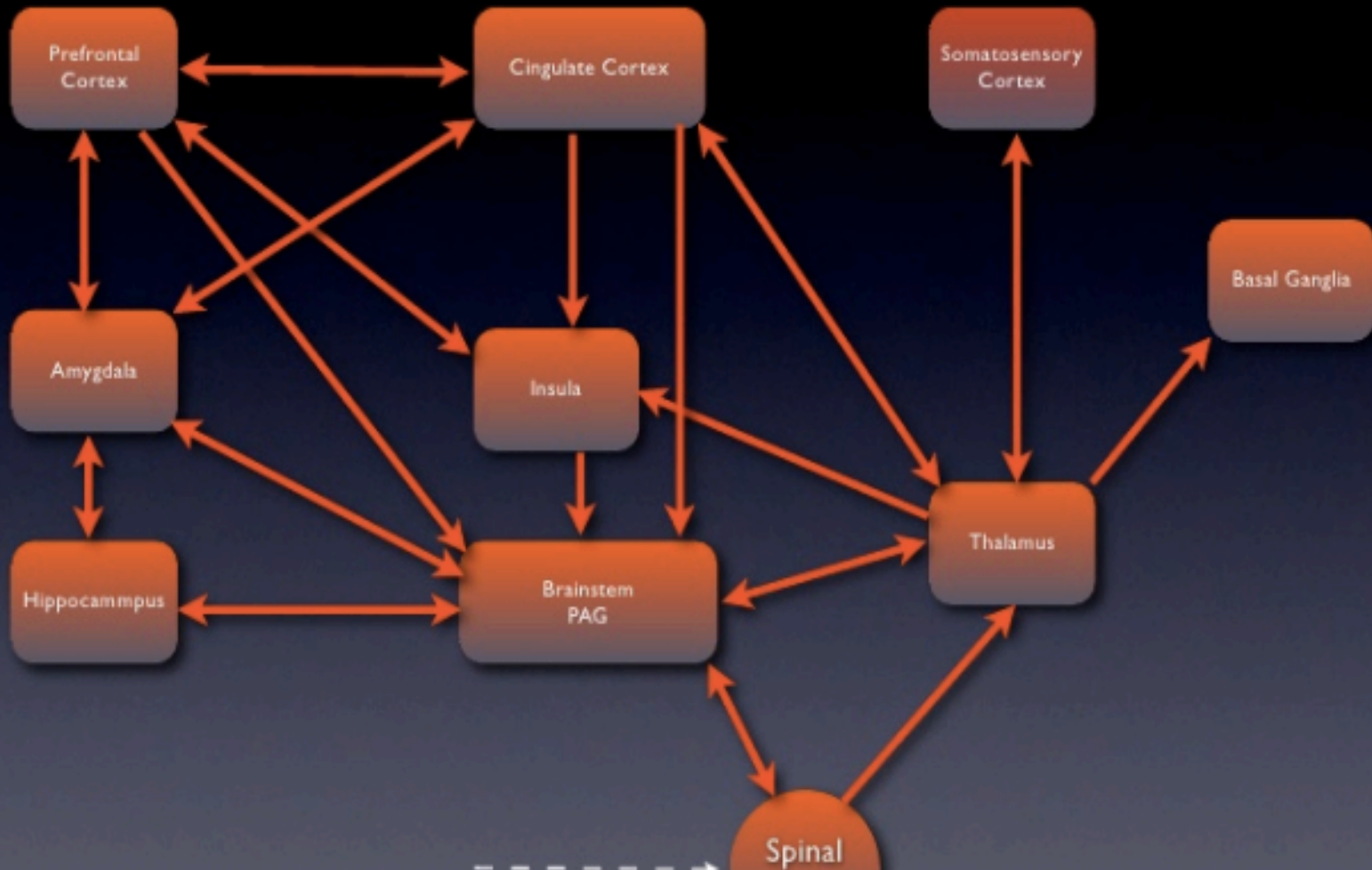
AIC, feelings and self referential processing(i) imagination

- For the visualization of internal state sensations this meant increased activity in areas of interoceptive sensory processing, including the mid and anterior insula in the right hemisphere. This is a critical finding, as it suggests that primary interoceptive cortex, located in the posterior insula, was not significantly involved in the imagery of internal state sensations (Bennett and Baird 2009)

Opioid Analgesia

- Low levels of opioids produce a higher level of response in AIC than PIC. i.e. in the structure which assigns and allows us to feel emotional significance of stimuli
- This is adaptive. it is easier to manage emotional response than bodily damage in short term.
- Long term and serious damage require the PAG and other descending pain management systems to fully engage the nociceptive system

Pain “matrix”



AIC, feelings and self referential processing(ii)

anaesthesia and empathy

- Empathy=imaginative rehearsal of other's feeling state
- Doesn't activate full pain matrix, just the AIC and mid insula. Maladaptive to actually feel the other's broken leg or bereavement we just need to feel its significance
- Empathy "if empathy relies on the recruitment of the representations and neural processes engaged by first-hand pain, then experimentally changing these representations will also affect empathy for pain."
- Opioid analgesia reduces empathy for others pain. Naloxone restored it.
- By targeting not the bodily/nociceptive aspect of pain matrix but mid and anterior IC
- (whose) "activity has been directly related to the *affective-motivational component of pain*". Rutgen et. al 2015

Pain Asymbolia

- The dissociability of aspects/components of emotional processing and self modelling at different levels of the hierarchy as explanatory power
- Nice example pain asymbolia:

Pain Asymbolia

- Pain asymbolics feel the pain, but do not seem to care about it or be motivated to avoid it. But this is not because they no longer represent bodily damage. It is rather that the way they integrate signals of bodily damage with representations of their subjective relevance has been compromised.
- Pain asymbolics have an intact “pain matrix” but hypoactive AIC.

Pain Asymbolia

- Pricked on the right palm, the patient smiles joyfully, winces a little, and then says, 'Oh, pain, that hurts.' She laughs, and reaches the hand further toward the investigator and turns it to expose all sides...The patient's expression is one of complacency. The same reaction is displayed when she is pricked in the face and stomach. (Schilder and Stengel 1928, p. 147)

Asymbolia and DPD

- If this is right, the phenomenology of asymbolia might resemble a kind of depersonalization syndrome. ... The asymbolic, and the depersonalized more generally, feel sensations that they are estranged from — that they do not take to be theirs in the sense that we normally do. ... [This] does show that there is another sense in which our sensations may be unified: as sensations over which we have a feeling of ownership. Asymbolia, and depersonalization more generally, shows that this sort of unity may fail. Its failure comes not from a change in the sensations we feel, but in the *sort of agents* we are. (Klein 2015) my italics.

Emotions and the affective self

- The affective self is a model the mind makes to interpret and predict *the way the world makes us feel*.

Self as object

- We experience a sense of being a unified persisting self in the same way we experience the world as populated by unified persisting objects.
- Fluctuations of affect are explained as changes in *the persisting entity which has the feelings*

SELF MODEL

GOALS PREFERENCE RANKINGS

REPRESENTATION

CONCEPTUAL SELF
Autobiographical

INFERENTIAL

Semantically represented
Narrative I

AFFECTIVE SELF
The entity to which
bodily changes matter
(determined by
relevance of those
changes to goals)

ACQUIRED,
SOCIAL

Affective
representation of
how the organism
is faring.

MINIMAL EMBODIED SELF
Entity changed by
encounters with the world

BIOLOGICAL
Hunger
Pain

Sensorimotor and
interoceptive
representation

Self models

- Hohwy and Michael to conceive of this internal model of endogenous causes as a representation of *the self*. The suggestion, then, is that agents model the self as a hierarchy of hidden, endogenous causes, and further, that the self is identical to these causes.
- Thomas Metzinger : “A self-model, an inner image of the organism as a whole [is] built into the world-model, and this is how the consciously experienced first-person perspective develop[s]” (2009: 64; see also 2004).

DPD

- Inferred representation of the self *as detached from even the most salient and emotionally significant events*
- Makes sense of difference between the way the world (including our bodies) feels and the way it should feel in context.
- i.e. secondary appraisal has a predictive model for feelings evoked in context and it is violated
- Because the AIC is no longer relaying the significance of information to reflective processes

DPD

- As one might expect, a crucial neural correlate of DPD is *hypoactivity* in the AIC
- A current hypothesis is that this hypoactivity is produced by involuntary inhibitory activity in the ventrolateral prefrontal cortex (Phillips et. al. 2001).
- The VLPFC is a structure that plays a crucial role in the downregulation of affective feeling, most obviously evidenced in studies of voluntary reappraisal (Füstös, Gramann et al. 2013; Kalisch 2009; Garland 2012; Ochsner and Gross 2005). As Medford says,
- “[in] DPD such suppression is apparently involuntary (and largely resistant to volitional control), but it is reasonable to suppose that this will nevertheless engage similar inhibitory networks” (2012, p. 142).
- The problem for the DPD patient is that the normal flow of affective states leads to the prediction that the AIC will produce a continuing sense of subjective presence affectively salient situations.

Conclusions

- Emotional Processes **exploit** other cognitive processes to determine subjective relevance of information processed in a **predictive coding hierarchy**
- The emotional processing hierarchy is best thought of as a **set of regulatory mechanisms**. Defined more by *time scale and regulatory goal than target and content*.
- The Self is a **predictive model** made by the mind to explain the fluctuation of affective states
- More precisely there is a level of self representation best described as the *affective self model which integrates bodily and narrative self models*