Worry and Rumination:
Concepts and Neurobiological correlates

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Introduction

- Worry and rumination:

- Definitions

- Theoretical concepts/ information processing

- Neural Correlates

- Clinical implications

Definition: Worry

- **Repetitive**, relatively **uncontrollable** toughts that emerge when a person faces a potential **threat**

(Beck, 1987)

- Association with **anxiety**: *state of* **anxious apprehension**

- Central feature of **Generalized Anxiety Disorder**

Theoretical Concepts: GAD

- **Verbal cognitive activity** that allows the individual to **avoid the intrusion of more arousing material** such as fear-related **images** and their associated **autonomic responses** (Borkovec 2004)

- **Theoretical models of GAD: AVOIDANCE OF INTERNAL EXPERIENCES**

- **Strategy for gaining emotional control:**

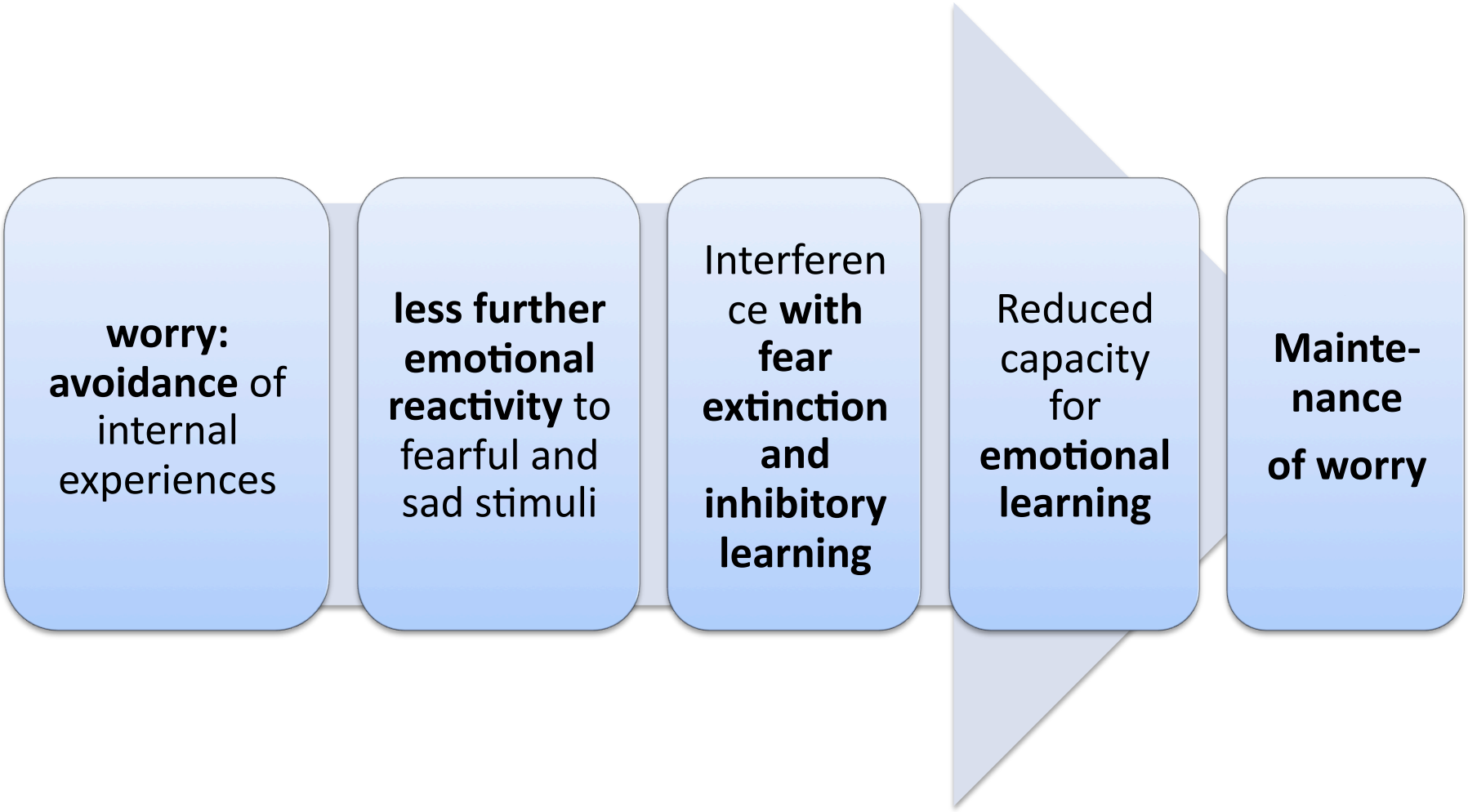
-> 'Short-term **protective role'**

-> Interferes with **functional emotional processing**

-> Prevents the extinction of **fear** (Review Behar et al. 2009)

EMOTIONAL INFORMATION PROCESSING: GAD

(Llera 2010; Newman 2011)



Definition: rumination

- Repeated **self-focused** toughts about **mood symptoms, negative aspects of one's self and one's life**

- Mostly related to **depression**

EMOTION FOCUSED RUMINATION

Resons styles theory – in respons to mood (Nolen-Hoeksema 1998)

STRESS-REACTIVE RUMINATION:

following stressful life events (Robinson and Aloy, 2003)

Theoretical Concepts: Rumination:

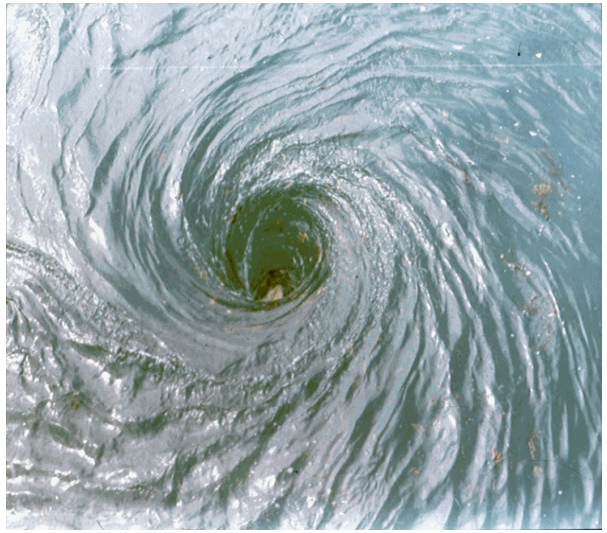
Problems in **'COGNITIVE TOP-DOWN CONTROL'** in **emotion regulation**

(Review Gotlib, 2010)

- **disengaging attention** from negative stimuli
- **negative autobiographical memories**
- **inhibitory control** of mood-congruent toughts/memories
- ability for **Reappraisal**

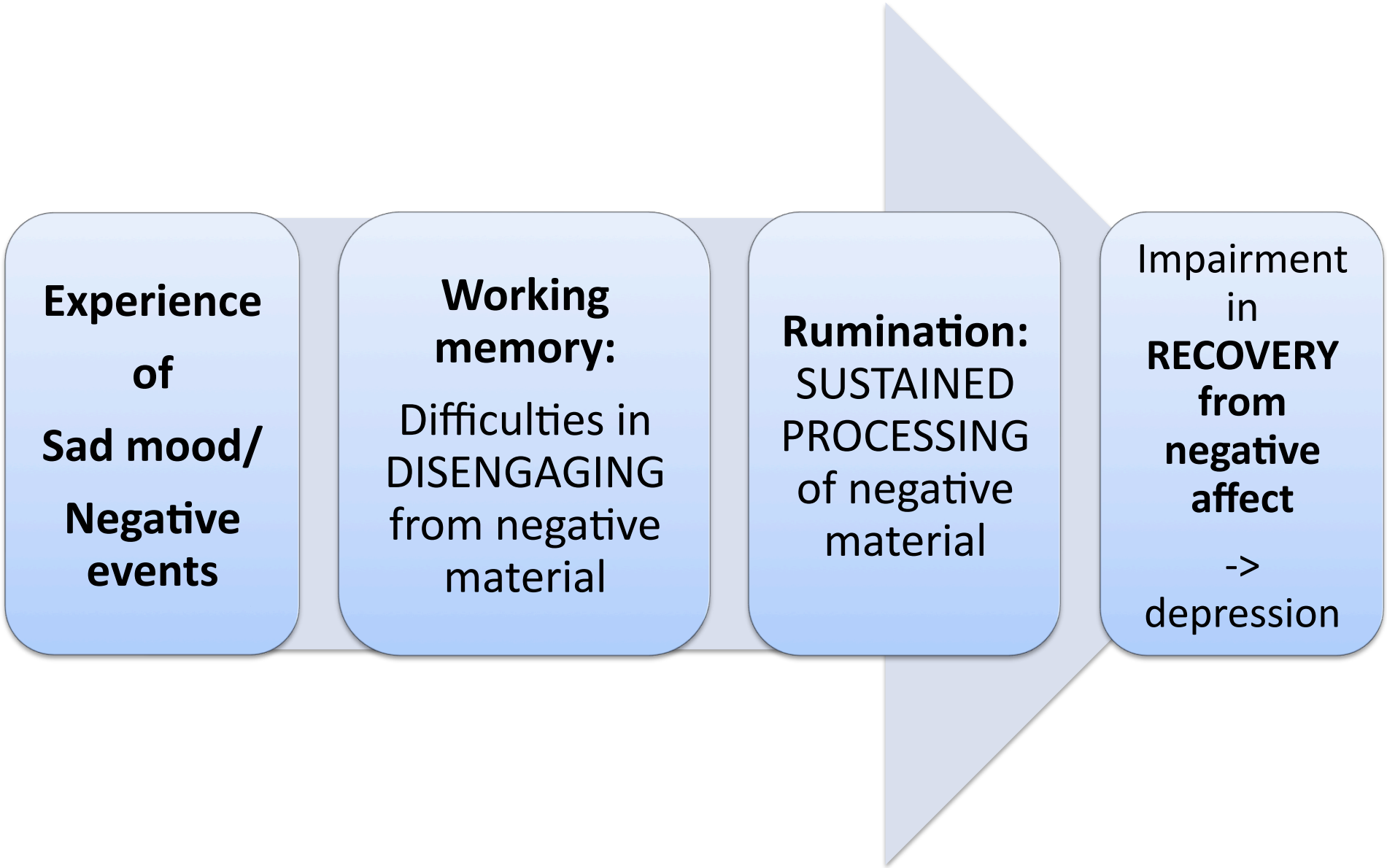
Content of WORKING MEMORY:

Sustained processing of negative material



EMOTIONAL INFORMATION PROCESSING:
Rumination

(Gotlib 2009, Smith 2010)



Worry versus Rumination

(Smith 2010, Hong 2006; Watkins 2005, Segerstrom 2003, Wells 1999)

WORRY

- **Anxious apprehension, GAD**
- **Content:** Future, problem-solving
- State of cognitive **over-control**
- **Avoidance** of internal experiences

RUMINATION

- **Depressive mood and symptoms**
- **Content:** Past, loss
- Problems in **cognitive control** of working memory
- Problems in **disengaging attention** form negative material

Bridge between theoretical concepts and neurobiology?

Neural correlates of Worry

- **Anxiety disorders: TWO CLASSES?** (Review Berkowitz 2007)

	Intense Fear/panic	GAD and OCD
Prefrontal cortex	↓	↑
Limbic system	↑	↓
Autonomic nervous system	↑	↓

- **Neural response to Emotional stimuli in GAD?**

  Hyporesponsiveness in amygdala to faces with fearful expressions in GAD

  (Blair 2008)

Worry: **non-clinical** population

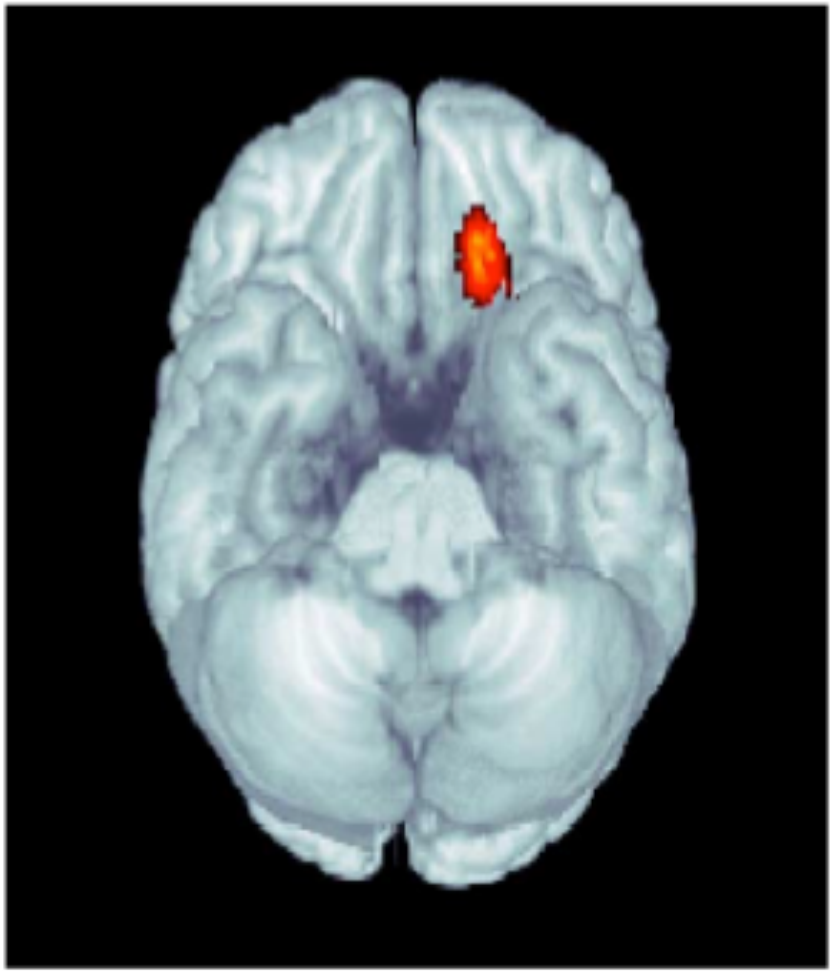


Fig. 3. Negative correlation between activated foci of the amygdalae and the left orbito-frontal cortex (height threshold: $P=0.005$; extent threshold: $k+100$ voxels).

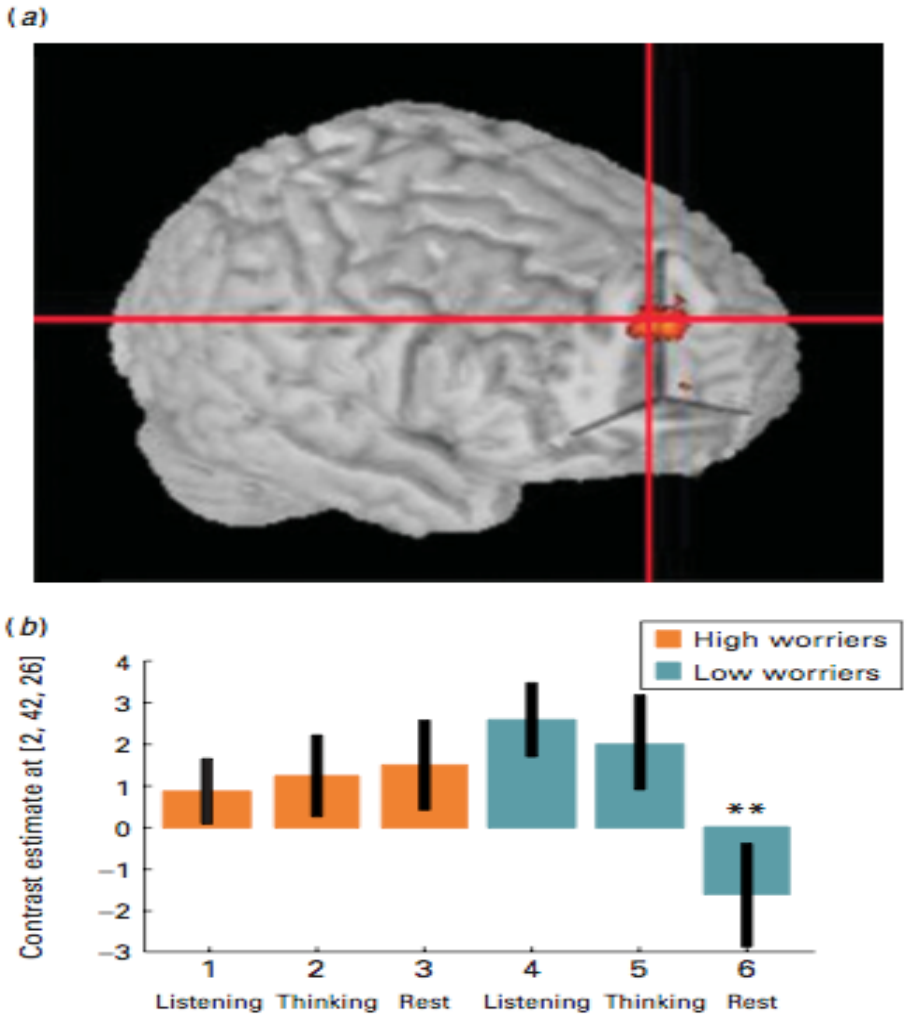
Negative correlation between activation of **left orbitofrontal cortex** and **amygdalae**

PREFRONTAL OVERACTIVATION CAUSES LIMBIC INHIBITION?

≈ avoidance theory?

(Hoehn-Saric 2005)

Worry: **GAD**



- ✓ **POST-WORRY RESTING STATE:**

  GAD: **same regions remain active**

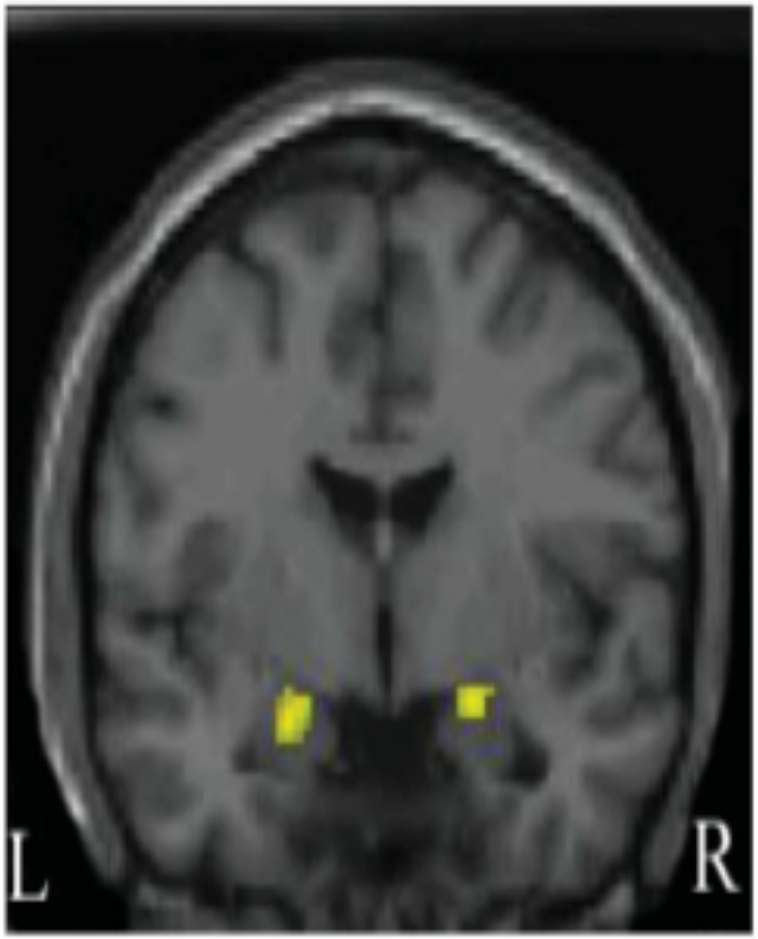
QUANTITATIVE DIFFERENCE!

~ Prolonged preoccupation in GAD?

(Paulesu et al. 2009)

Rumination: nonclinical samples

(Ray and Ochsner 2005)



Trait rumination correlation with Amygdala activation in negative Reappraisal task

TRAIT RUMINATION:

↓ Top-Down prefrontal control causing disinhibition amygdalae?

Rumination: **Clinical** samples

- **RUMINATION INDUCTION TASK** (Cooney 2010)

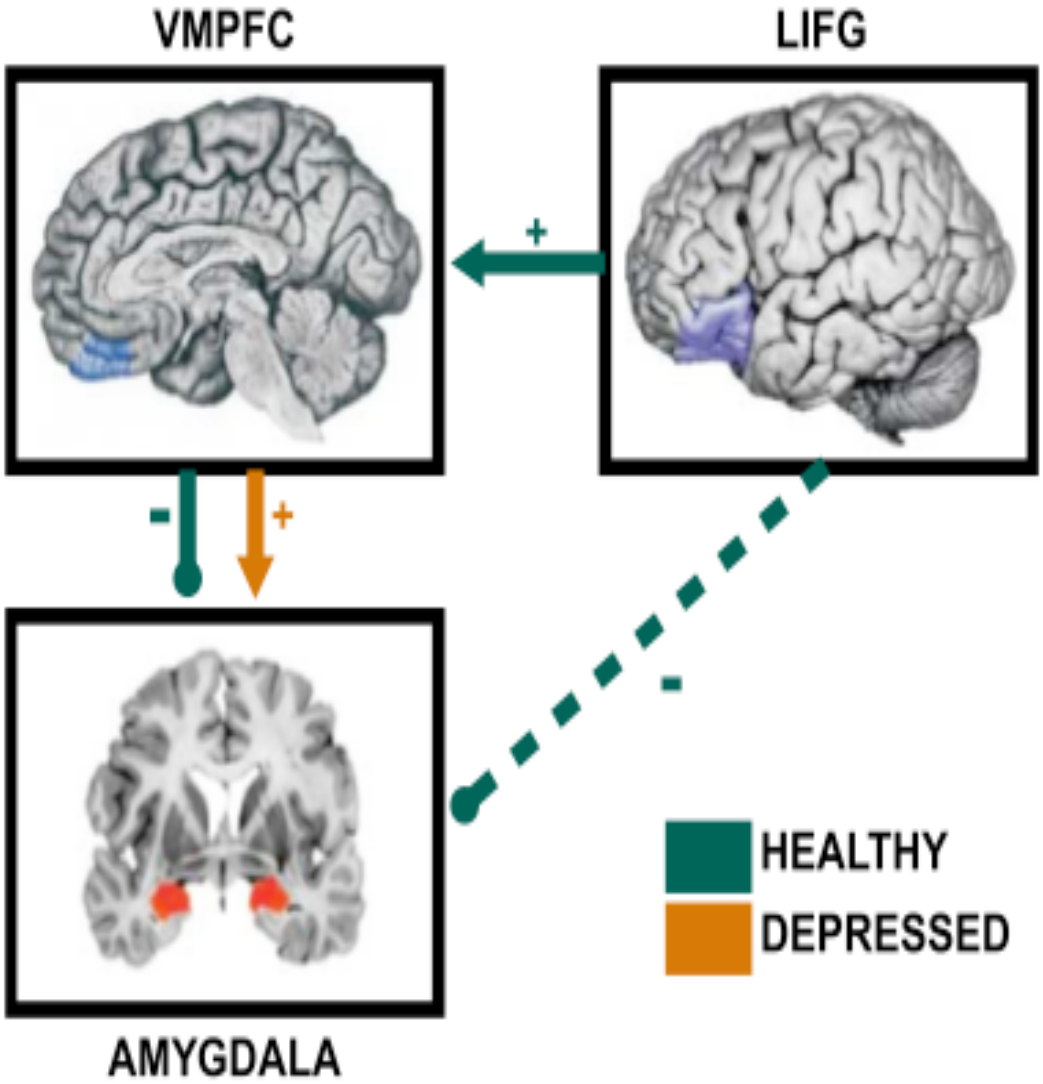
  Hyperactivity in **limbic structures**, areas involved in **mediating self-referential content** (mPFC, ACG), retrieval of **mood-congruent autobiographical memories** (parrahippocampus, PCG)

  ≈ **disinhibition limbic system**

  ≈ **activation areas self-referential thinking**

  ≈ **disengment problems**

Rumination: clinical samples



FAILURE TO REGULATE MOOD IN DEPRESSION?

counterproductive recruitment in top-down prefrontal-subcortical

(Johnstone 2007)

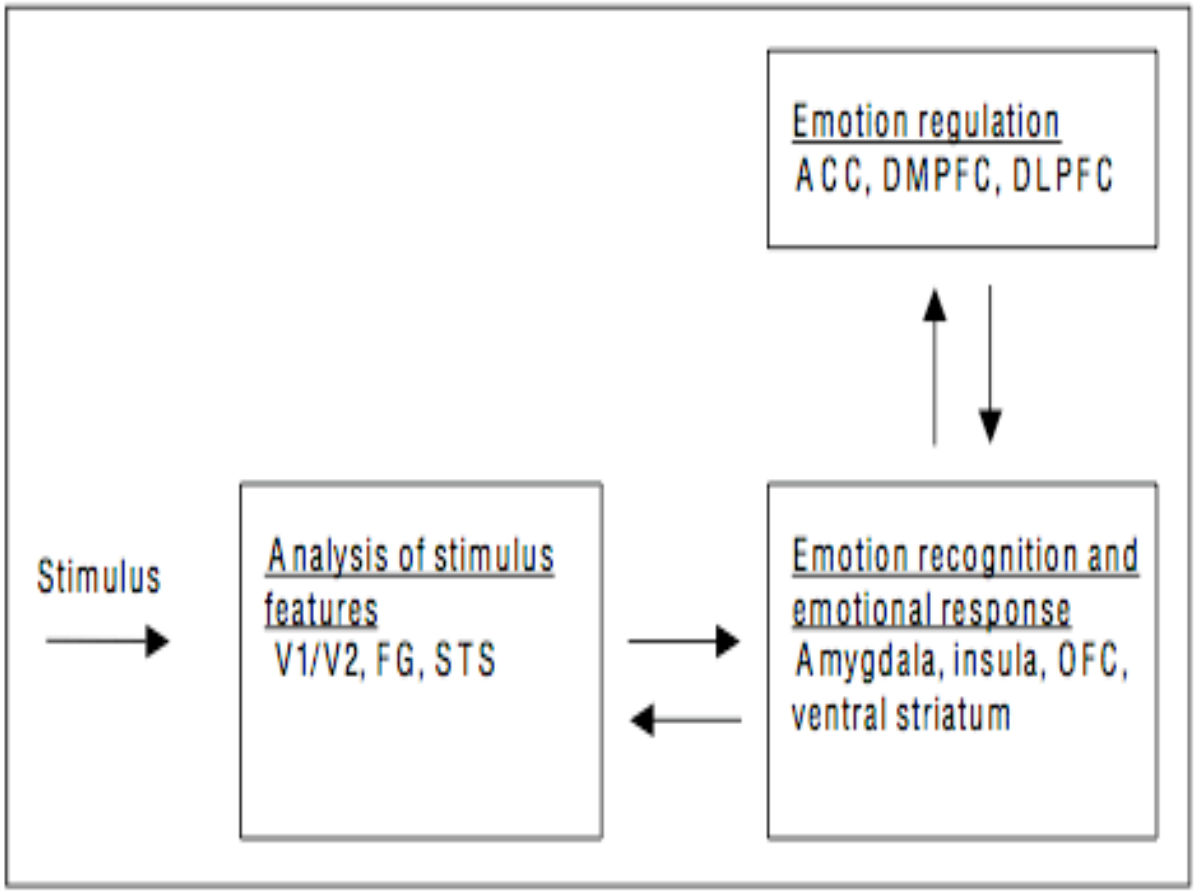
SUMMARY

WORRY	RUMINATION
emotional **CONTROL** strategy **AVOIDANCE** of internal experiences	**TOP-DOWN** problems in control of content working memory dificulties **DISENGAGING** from negative material
Worry-induced **OVERACTIVATION OF PREFRONTAL REGIONS**	Attenuated **activation of top-down prefrontal control**, **sustained overactivation** of regions mediating **SELF-REFLECTION**
SUPRESSION OF LIMBIC REGIONS	**DISINHIBITION OF LIMBIC REGIONS**

Integrative research from an **'emotional information processing'**- point of view
(Lepännen 2006)

Figure 2. A simplified diagram showing the psychological processes involved in the processing of (visual) emotional signals and the neural structures that subserve these processes

Modified from models presented in [22–25]. ACC, anterior cingulate cortex; DLPFC, dorsolateral prefrontal cortex; DMPFC, dorsomedial prefrontal cortex; FG, fusiform gyrus; OFC, orbitofrontal cortex; STS, superior temporal sulcus.



Clinical Relevance

- **Cognitive vulnerability factors**

  high risk populations (offspring, partial remitted, recovered)

  differences in **cognitive and neural processing of emotional stimuli** may play a **key role** in the development, maintenance or recurrence of mood and anxiety disorders (Lepännen 2007)

- **Attention and cognitive interpretation training** program (Mathews 2004)
- **Rumination-focused CBT** for residual depression (Watkins 2007)

- **Outpatient CBT-based group program UZ Gent**: 8 sessions

  Protocol: attention training, development of alternative strategies; effective engagement in tasks, functional thinking styles

BJPsych | The British Journal of Psychiatry (2011) 199, 317–322. doi: 10.1192/bjp.bp.110.090282

Rumination-focused cognitive–behavioural therapy for residual depression: phase II randomised controlled trial

Edward R. Watkins, Eugene Mullan, Janet Wingrove, Katharine Rimes, Herbert Steiner, Neil Bathurst, Rachel Eastman and Jan Scott

Table 2 Mean (s.d.) scores on outcome measures at baseline assessment and post-intervention assessment for rumination-focused cognitive–behavioural therapy (RFCBT) group and treatment as usual (TAU) group

Measure	Baseline		Post-treatment		Mean difference in change scores[a] (95% CI)	Effect size[b]
	TAU	RFCBT	TAU	RFCBT		
Hamilton Rating Scale for Depression	12.19 (2.80)	13.29 (3.32)	9.05 (5.25)	5.48 (5.15)	4.67 (0.28–9.05)	0.94
Beck Depression Inventory-11	28.29 (7.63)	30.76 (8.17)	20.71 (10.84)	12.71 (11.37)	7.57 (1.86–19.08)	1.11
Rumination Scale of Response Style Questionnaire	59.17 (8.55)	58.45 (12.34)	54.38 (11.02)	44.50 (12.86)	9.16 (−3.4–21.73)	0.65

a. Mean difference in change scores: change on outcome measure from baseline to post-treatment for rumination-focused cognitive–behavioural therapy minus change in outcome measures from baseline to post-treatment for treatment as usual.
b. Between-group effect size for change in symptoms (Cohen's d where $d = M_1 - M_2/\sigma_{pooled}$, $\sigma_{pooled} = \sqrt{[(\sigma_1^2 + \sigma_2^2)/2]}$. ($M_1$ is the mean change on outcome measure from baseline to post-treatment for rumination-focused cognitive–behavioural therapy; M_2 is the mean change in outcome measures from baseline to post-treatment for treatment as usual). Large effect sizes were defined as ≥ 0.80.

Response: 26% (TAU) v. 81% (rumination-focused CBT)
Remission: 21% (TAU) v. 62% (rumination-focused CBT)
Relapse: 53% (TAU) v. 9.5% (rumination-focused CBT)

12 Sessies

With aknowledgment to Dr Van den Abbeele, UZ Gent

Professor Lemmens, UZ Gent