

# Cognitive Dysfunction in Major Depressive Disorder

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‘If a fright or despondency lasts for a long time, it is a melancholic affection’

Hippocrates, Aphorisms, Section 6,  
no. 23

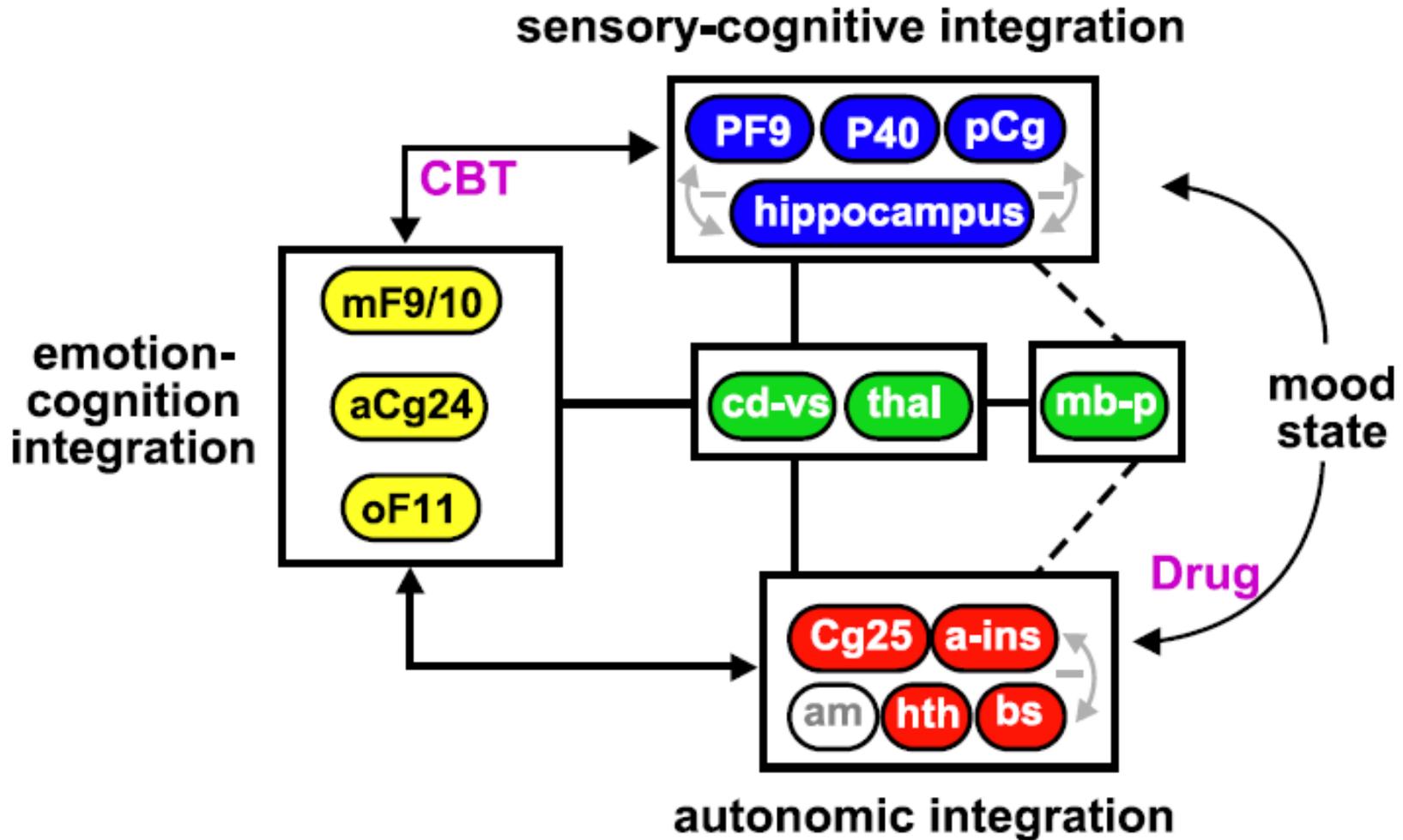
# Major Depression Model

Disorder of brain systems that regulate:

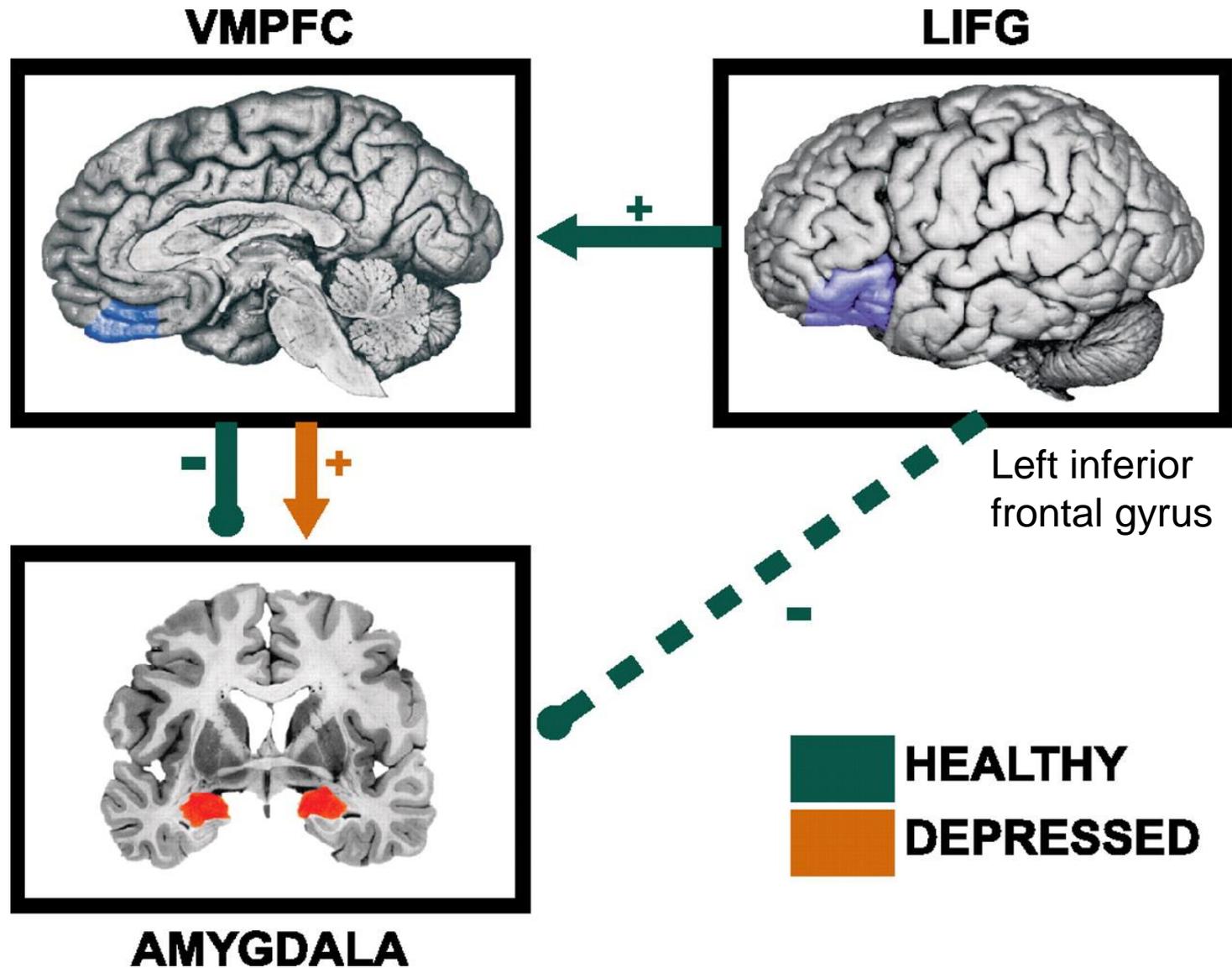
- Mood,
- Motivation,
- Cognitive,
- Endocrine, and
- Behavioral functions.

Murrough et al. *Neurobiology of Learning and Memory* 96:553 – 563;2011  
Mayberg 2003, Price and Drevets 2010, Seminowicz 2004

# MDD Circuitry Model



# Schematic depicting brain regions that showed a significantly different association with amygdala in the control versus depressed



# Cognitive Dysfunction in MDD

- Cognitive biases
  - distorted information processing
  - attentional allocation toward negative stimuli
- Cognitive deficits
  - impairments in attention
  - short-term memory
  - executive functioning

# Distorted Information Processing

- Cognitive schemas
  - Negative themes self, future, world
  - Basis for CBT
- Perception and attention
  - preferential perception and processing towards negative information
- Interpretation
- Memory

# Distorted Information Processing: Interpretation

- Attribution and inferential biases
- Negative inferences for the causes and consequences of life events
- Facial expressions of emotion more negative or less positive than do matched non-depressed individuals

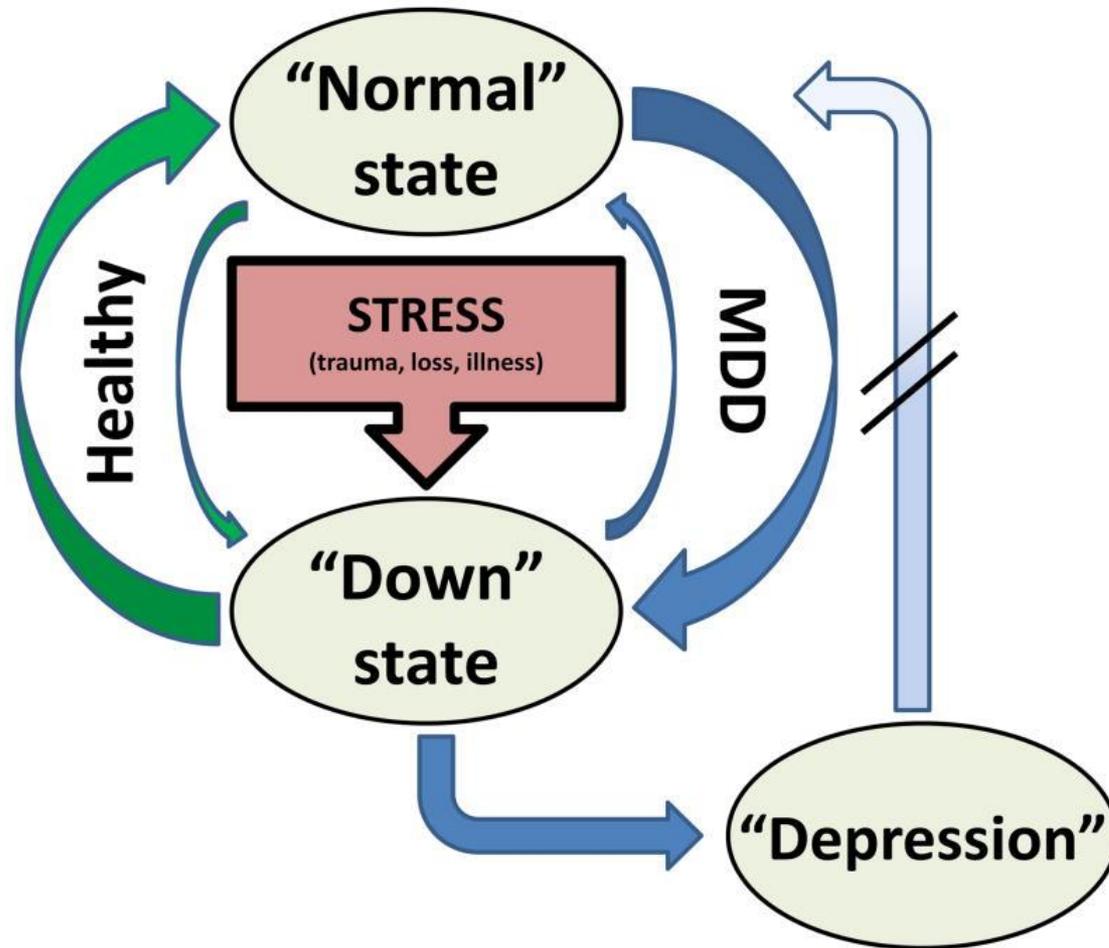
# Distorted Information Processing: Memory

- More likely to remember negative emotional information
  - Self-relevant tasks
  - Negative words
  - Negative faces
- Recalled more generic or over general memories
  - Over generalization target of CBT

# Attentional allocation toward negative stimuli

- Early stages of processing
  - only modest evidence to support an association between major depression and a subliminal attentional bias toward negative material
- Later stages of processing
  - involves difficulties in disengaging from negative material once it captures an initial attention

# Stuck in a Rut



# Cognitive Bias: MDD Sticky Negative Thoughts.

When negative material was removed from working memory compared to when it was maintained in working memory, greater increase in activation in:

- Dorsal anterior Cingulate (dACC),
- Left and right insula, and
- Superior parietal lobe areas

# Clinical Manifestations

- Vulnerable to elaborating on negative material in their environment
- Difficulty disengaging from and inhibiting processing of negative valenced content
- Ruminates

# Cognitive Deficits: Impairments in attention

- Resource allocation hypothesis
  - depression uses cognitive resources and reduces cognitive capacity
  - Difficulties engaging in effortful cognitive tasks
- Impairments of effortful attention
  - processing speed,
  - selective attention
- No impairments in automatic processing

Hammar, A., Lund, A., & Hugdahl, K. (2003). Journal of the International Neuropsychological Society: JINS, 9, 954–959. Ellis, HC.; Ashbrook, PW. In: Fiedler, K.; Forgas, JP., editors. Affect, Cognition, and Social Behavior. Gottingen;Hogrefe: 1988. p. 25-43

# Cognitive Deficits: Impairments in attention

- Affective interference hypothesis
  - depression involves a preoccupation with emotional material,
  - performance selectively impaired on cognitive tasks that require individuals to ignore emotional information

# Cognitive Deficits: Short-term memory

- Working memory
  - the system involved in the active maintenance and manipulation of information
- Diminished ability
  - to attend to task-relevant stimuli and
  - to inhibit task-irrelevant information
- MDD with impairments in cognitive control and inhibition

# Cognitive Deficits: Executive dysfunction

- Executive processing
  - control and update the contents of working memory
  - protect working memory from intrusions of irrelevant information
  - discarding information no longer relevant
- Intrusive negative thoughts
- Decreased inhibition of negative inputs
- Decreased intentional forgetting

# Funes the Memorious

- “I alone have more memories than all of mankind has probably had since the world has been the world.”
- “My memory, sir, is like a garbage heap”

# Implications for Treatment

- Well Being Therapy
- Cognitive Control
- Decrease overgeneralizations

Kircanski et al. Wiley Interdiscip Rev Cogn Sci. 2012;3(3):301–313

Ruini and Fava. Clin Psychol Psychother. 2012 Jul-Aug;19(4):291-304

# Summary

- MDD associated with cognitive dysfunction
- Brain circuits and connectivity
  - Impaired cognitive control
- Cognitive biases
- Cognitive deficits
- Ruminations
- Implications for treatment