faulty circuits

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Mental disorders such as depression display no conspicuous brain damage, they were long thought to stem from purely psychological processes.

Neural imaging is revealing that abnormal activity along a circuit of brain structures involved in mental processing underlies many mental disorders, making the physical dysfunction causing the mental symptoms visible for the first time.

Understanding the biology of mental disorders will clarify the sources of malfunction in a circuit, provide objective methods of diagnosis and lead to targeted treatments.
Major depressive disorder

- 16% of all Americans
- Most prevalent illness in developed world

Leading cause of

- Medical disability among people between the ages 15 and 44

Mental Symptoms

- Profound sense of despair
- Helplessness & hopelessness

Physical symptoms

- Loss of appetite
- Sleep disturbances and fatigue
- Disturbs immune and hormonal systems
Depression sufferers have low energy and mood

- reaction times and memory formation are inhibited
- anxiety and sleep disturbances, suggest certain brain areas are overactive
Also known as subgenual cingulate cortex (Cg25)
Depression circuit

- Prefrontal cortex
- Insula
- Simplified depression circuit
- Hypothalamus
- Hippocampus
- Area 25
- Amygdala
Cg25 – Subgenual cingulate cortex

• Increased activation during acute sadness.
• (PET)

Cg25 activity decreased after...

• Depressed patients treated with fluoxetine.
• Fluoxetine- SSRI - Prozac, Sarafem

measured with positron emission tomography (PET)
Serotonin transporters manage the amount of serotonin available to neurons.

Cg25

- Rich with serotonin transporters
- “short” variation – causes less of the transporter protein to be manufactured.
- Individuals with “short” variation had reduced tissue volume in Cg25.
- Cg25 was functionally uncoupled in “short” variation population.

Depression

- Predisposition to “short” variation of the 5HTP transporter gene – leads to higher depression risk.
- Abnormal activity in Cg25 disrupts the hypothalamus, amygdala, insula, hippocampus and prefrontal cortex.
Hypothalamus and brainstem
- influence changes in appetite, sleep and energy

Amygdala and insula
- affect anxiety and mood

Hippocampus
- critical to memory processing and attention

Prefrontal cortex
- mediate insight and self-esteem

A dysfunctional Cg25 can lead to distorted assessments of the internal and external world.