

# Neuroscience of Mental Health Disorders Part 4

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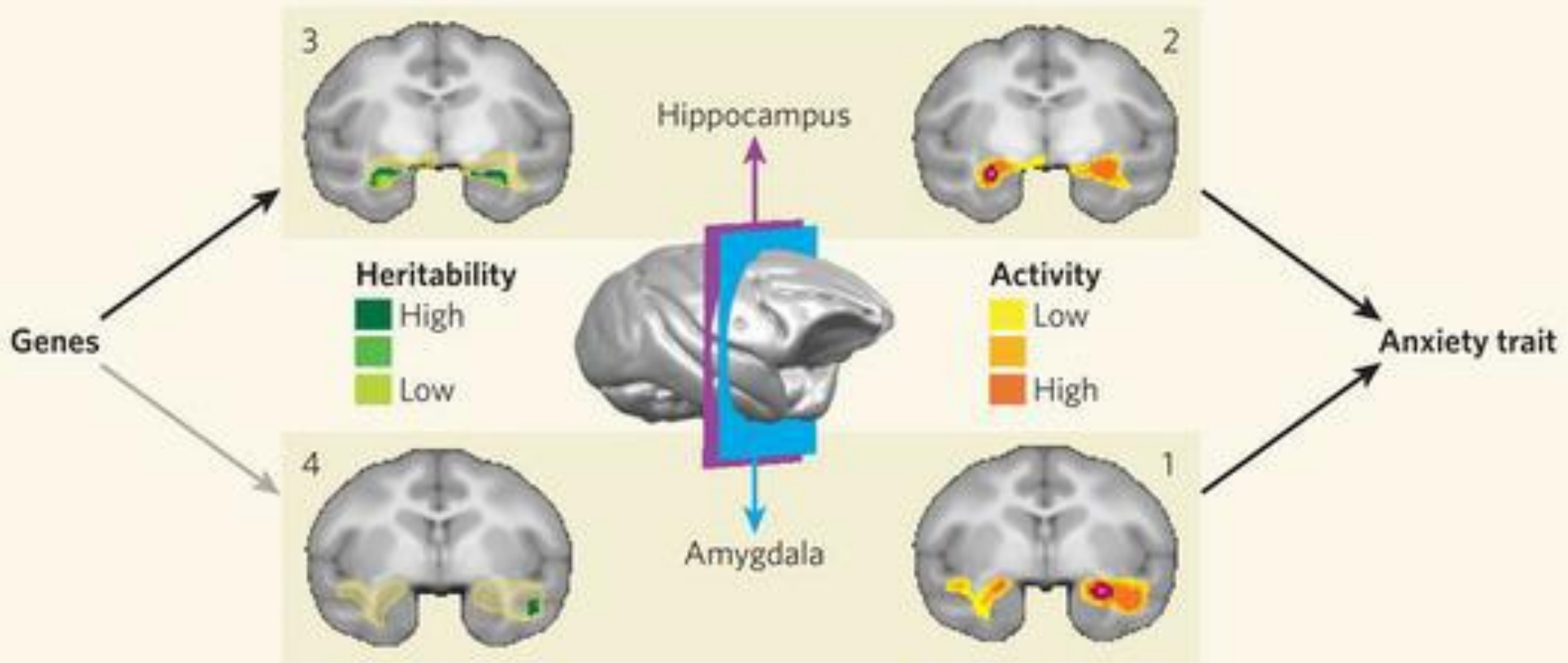
# ANXIETY



# Variety of Faces of Anxiety Disorders

Common of anxiety disorders include:

- Panic disorder: In addition to anxiety, common symptoms of panic disorders are palpitations (feeling your heart beat), dizziness, and shortness of breath. These same symptoms also can be caused by coffee (caffeine), amphetamines ("speed" is the street slang for amphetamines when they are not prescribed by a doctor), an overactive thyroid, abnormal heart rhythms, and other heart abnormalities (such as mitral valve prolapse).
- Generalized anxiety disorder
- Phobic disorders
- Stress disorders

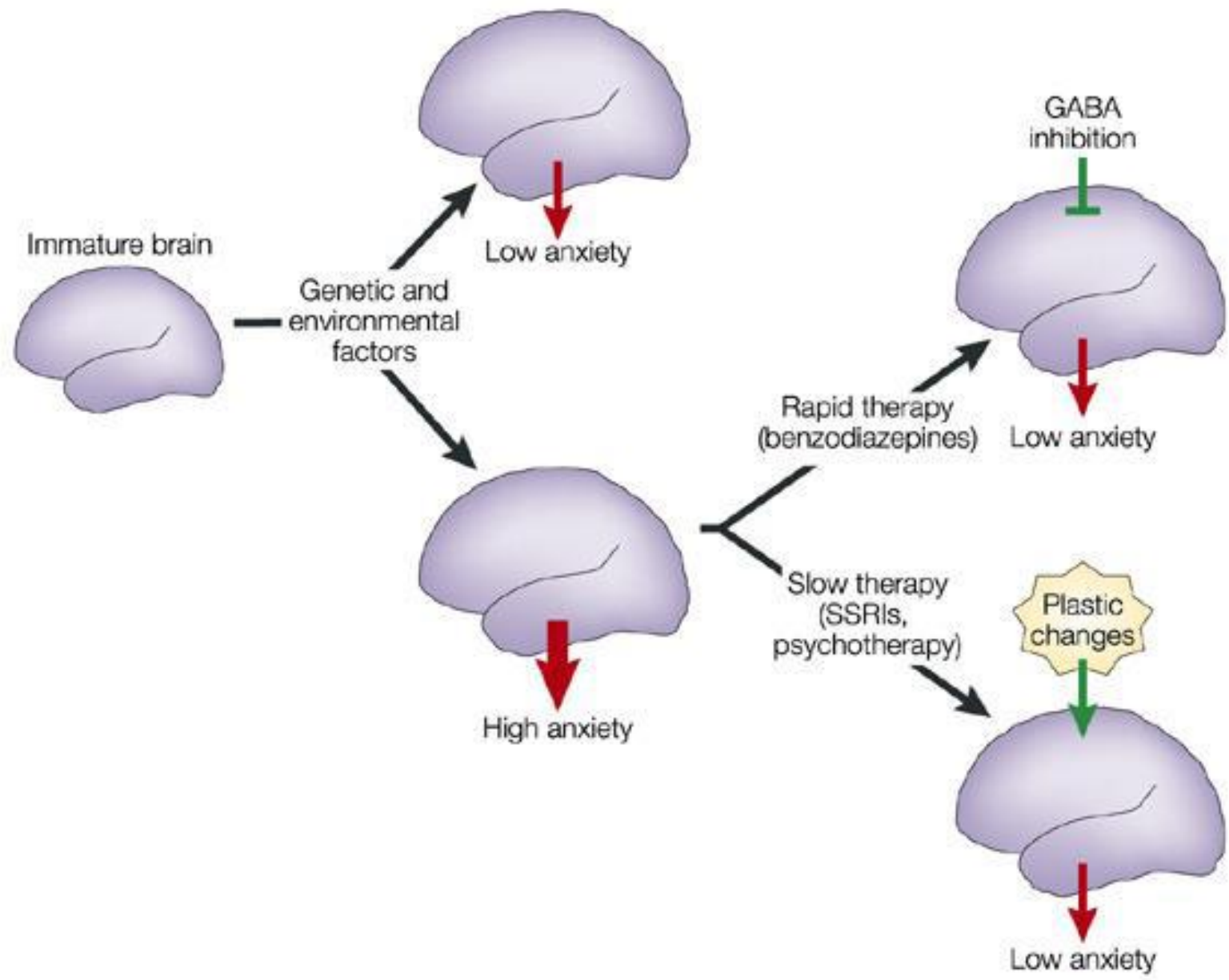


# Causes of Anxiety

Anxiety may be caused by a mental condition, a physical condition, the effects of drugs, or a combination of these and the initial task is to see if the anxiety is caused by a medical condition.

Other causes are:

- Stress at work
- Stress from school
- Stress in a personal relationship such as marriage
- Financial stress
- Stress from an emotional trauma such as the death of a loved one
- Stress from a serious medical illness
- Side effect of medication
- Use of an illicit drug, such as cocaine
- Symptom of a medical illness (such as heart attack, heat stroke, hypoglycemia)
- Lack of oxygen in circumstances as diverse as high altitude sickness, emphysema or pulmonary embolism (a blood clot in the vessels of the lung)



# What Are the Symptoms of Panic Disorder?

- Difficulty breathing.
- Pounding heart or chest pain.
- Intense feeling of dread.
- Sensation of choking or smothering.
- Dizziness or feeling faint.
- Trembling or shaking.
- Sweating
- Nausea or stomach ache.
- Tingling or numbness in the fingers and toes.
- Chills or hot flashes.
- A fear of losing control or are about to die.

# What Causes Panic Disorder?

Although the exact cause of panic disorder is not fully understood, studies have shown that a combination of factors, including biological and environmental, may be involved. These factors include.

- Family history. Panic disorder has been shown to run in families. It may be passed on to some people by one or both parent(s) much like hair or eye color can.
- Abnormalities in the brain. Panic disorder may be caused by problems in parts of the brain.
- Substance abuse. Abuse of drugs and alcohol can contribute to panic disorder.
- Major life stress. Stressful events and major life transitions, such as the death of a loved one, can trigger panic disorder.



# Always rule out Medical Condition with Panic Disorder

- Doctors have the often-difficult task of determining which symptoms come from which causes.
- For example, in a study of people with chest pain - a sign of heart disease - 43% were found to have a panic disorder, not a heart-related condition.
- Doctors may do blood or urine tests to rule out other conditions, such as thyroid problems that can cause similar symptoms.

# Brain Chemistry of Generalize Anxiety Disorder

GAD has been associated with abnormal levels of certain neurotransmitters in the brain.

Neurotransmitters are special chemical messengers that help move information from nerve cell to nerve cell.

If the neurotransmitters are out of balance, messages cannot get through the brain properly.

This can alter the way the brain reacts in certain situations, leading to anxiety.

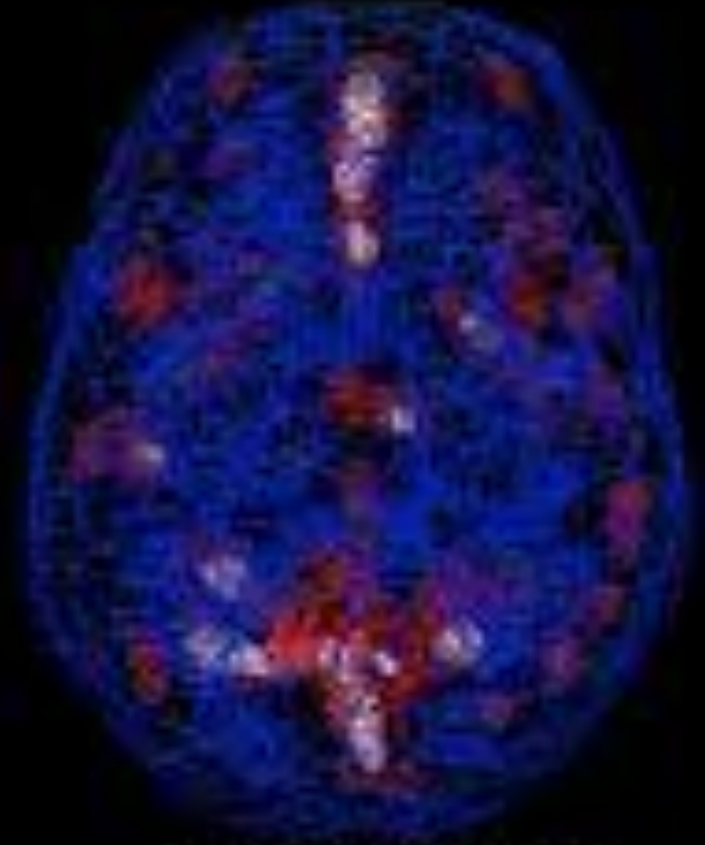
# Components of Anxiety

- **Emotional** — Anxious mood, depressed mood
- **Cognitive** — Intellectual
- **Somatic** — Muscular, sensory, cardiovascular, respiratory, gastrointestinal, genitourinary, autonomic
- **Behavioral** — Tension, fears, insomnia, interview behavior

# Panic Disorder



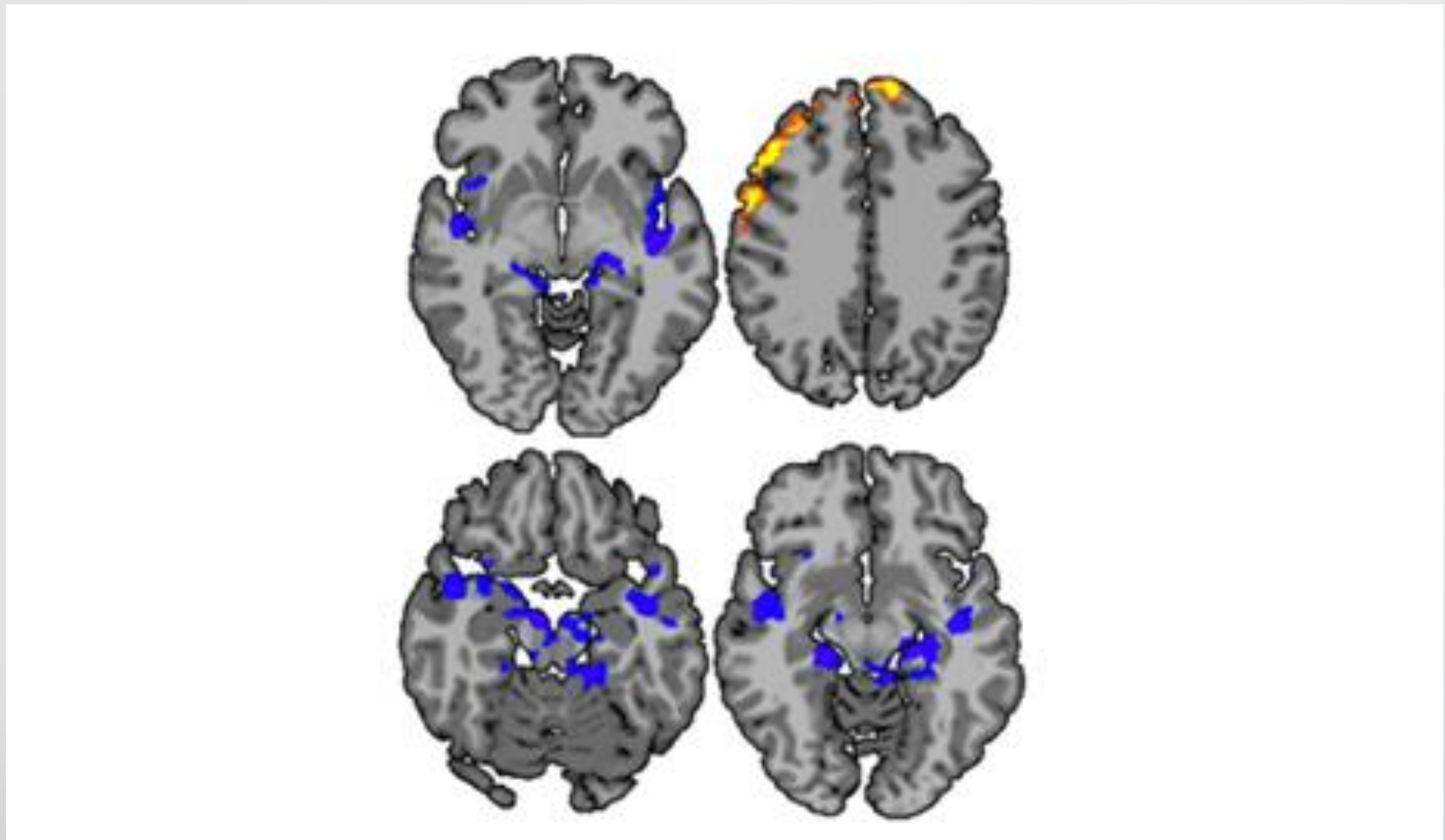
Healthy Brain



Lyme Toxic Brain

# Use of fMRI in study of lowering anxiety in patients

- Using functional magnetic resonance imaging (fMRI), Yale researchers displayed the activity of the orbitofrontal cortex, a brain region just above the eyes, to subjects while they lay in a brain scanner.
- Through a process of trial and error, these subjects were gradually able to learn to control their brain activity. This led both to changes in brain connectivity and to increased control over anxiety. These changes were still present several days after the training.
- Extreme anxiety associated with worries about dirt and germs is characteristic of many patients with obsessive-compulsive disorder (OCD). Hyperactivity in the orbitofrontal cortex is seen in many of these individuals.
- fMRI-driven neurofeedback has been used before in a few contexts, but it has never been applied to the treatment of anxiety. The findings raise the possibility that real-time fMRI feedback may provide a novel and effective form of treatment for OCD.



This image from the study shows changes in degree of connectivity in the feedback group. Increases are shown in red/yellow and decreases in blue/purple. Decreases in connectivity are seen in limbic areas, and increases are seen in prefrontal regions.

# Obsessive Compulsive Disorder



# What is OCD?

- Obsessive-compulsive disorder (OCD) is a potentially disabling illness that traps people in endless cycles of repetitive thoughts and behaviors.
- People with OCD are plagued by recurring and distressing thoughts, fears, or images (obsessions) they cannot control.
- The anxiety (nervousness) produced by these thoughts leads to an urgent need to perform certain rituals or routines (compulsions).
- The compulsive rituals are performed in an attempt to prevent the obsessive thoughts or make them go away.
- Although the ritual may temporarily alleviate anxiety, the person must perform the ritual again when the obsessive thoughts return.
- This OCD cycle can progress to the point of taking up hours of the person's day and significantly interfering with normal activities.
- People with OCD may be aware that their obsessions and compulsions are senseless or unrealistic, but they cannot stop them.



# What Are the Symptoms of OCD?

The symptoms of OCD, which are the obsessions and compulsions, may vary. Common obsessions include:

- Fear of dirt or contamination by germs
- Fear of causing harm to another
- Fear of making a mistake
- Fear of being embarrassed or behaving in a socially unacceptable manner
- Fear of thinking evil or sinful thoughts
- Need for order, symmetry, or exactness
- Excessive doubt and the need for constant reassurance

# Common OCD Compulsions

- Repeatedly bathing, showering, or washing hands
- Refusing to shake hands or touch doorknobs
- Repeatedly checking things, such as locks or stoves
- Constant counting, mentally or aloud, while performing routine tasks
- Constantly arranging things in a certain way
- Eating foods in a specific order
- Being stuck on words, images or thoughts, usually disturbing, that won't go away and can interfere with sleep
- Repeating specific words, phrases, or prayers
- Needing to perform tasks a certain number of times
- Collecting or hoarding items with no apparent value

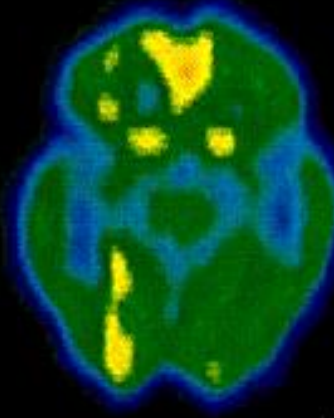
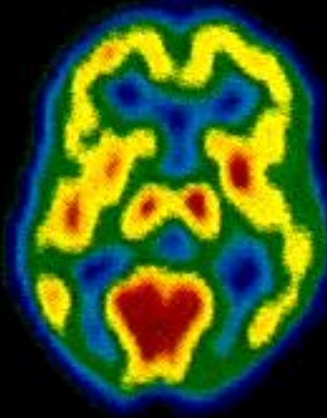
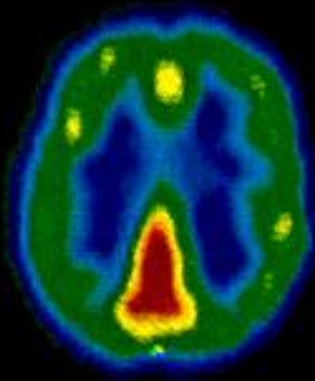
# What Causes OCD?

## Biological Factors

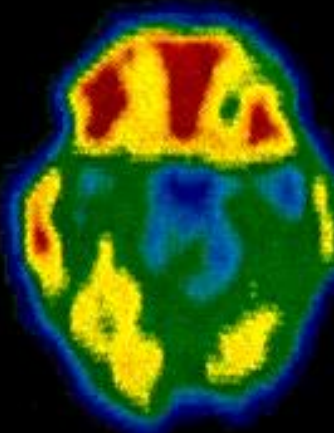
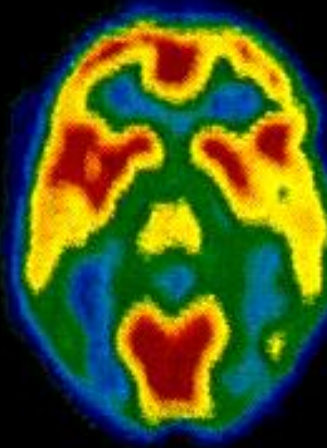
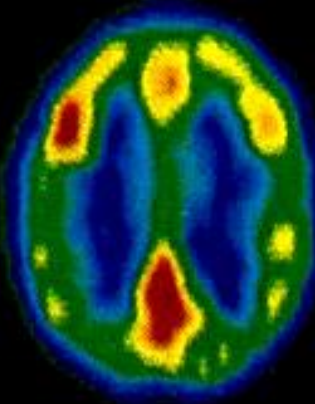
Although the exact cause of OCD is not fully understood, studies have shown that a combination of biological and environmental factors may be involved.

- At one time, it was thought that low levels of the neurotransmitter serotonin was responsible for the development of OCD.
- Now, however, scientists think that OCD is a disturbance of brain circuitry between the frontal lobe and subcortical areas. This results in problems in the pathways of the brain that link areas dealing with judgment and planning with another area that filters messages involving body movements.
- In addition, there is evidence that OCD symptoms can sometimes get passed on from parents to children. This means the biological vulnerability to develop OCD may sometimes be inherited.
- Studies also have found a link between a certain type of infection caused by the Streptococcus bacteria and OCD. This infection, if recurrent and untreated, may lead to the development of OCD and other disorders in children.

NORMAL CONTROL



OBSESSIVE COMPULSIVE



52.0
49.6
47.2
44.9
42.5
40.2
37.8
35.4
33.1
30.7
28.3
26.0
23.6
21.3
18.9
16.5
14.2
11.8
9.5
7.1
4.7

# What Causes OCD?

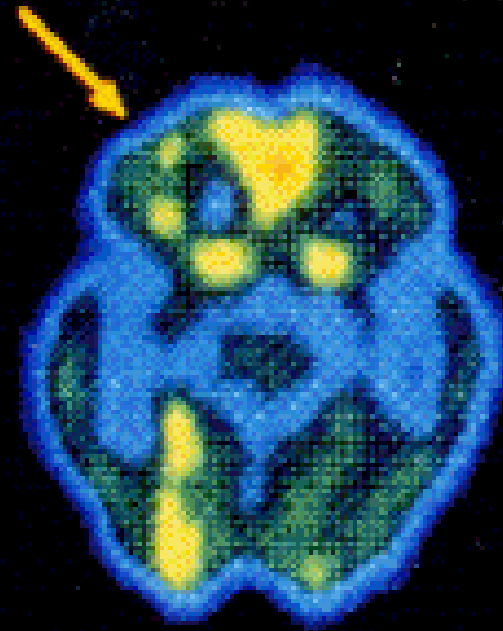
## Environmental Factors

There are environmental stressors that can trigger OCD in people with a tendency toward developing the condition. Certain environmental factors may also cause a worsening of symptoms. These factors include:

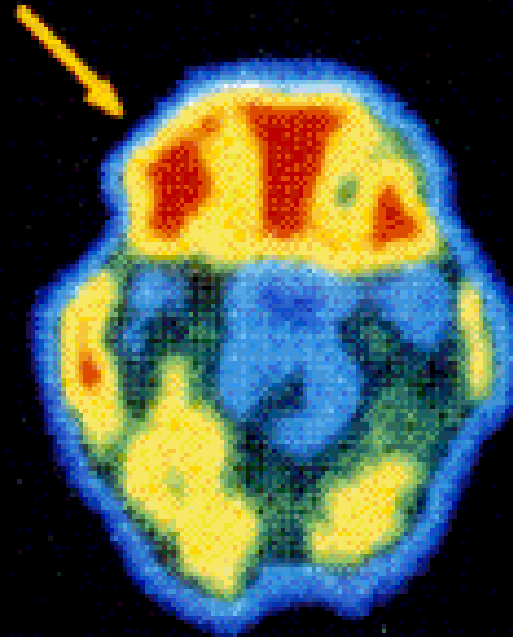
- Abuse
- Changes in living situation
- Illness
- Death of a loved one
- Work- or school-related changes or problems
- Relationship concerns

# Obsessive Compulsive Disorder

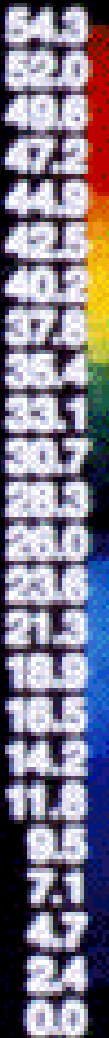
High Orbital Glucose Metabolism



Normal  
Control

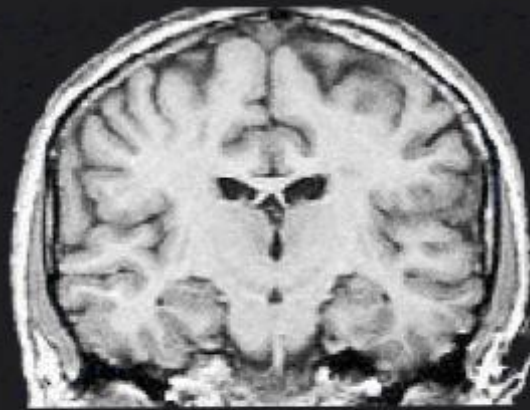


Obsessive  
Compulsive

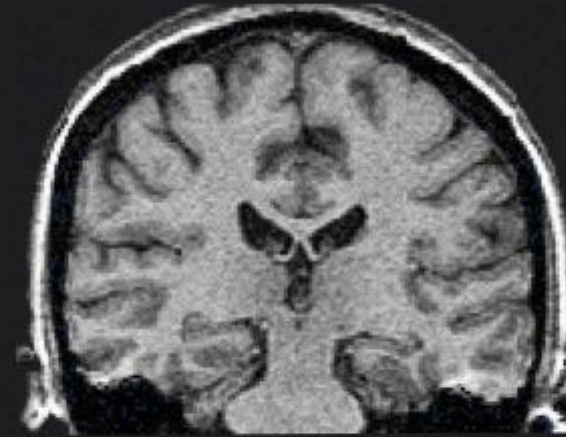


medication, development, assault, stress, post traumatic stress disorder, neuroendocrinology, numbing, disturbance, flashbacks, veterans, biochemical, health problems, behavioural, drug addiction, disorder, event, cognitive, fear, thinking, Feeling, memories, criteria, avoidance, mental health problems, distressing dreams, alternative help, survivors, risk, trauma, hypervigilance, anxiety, avoid, feel, hippocampus, counselling, horror, anxious, increased, accidents, death, trigger, acute, arousal, treatments, psychological, family, life, intervention, loose, drink

NO PTSD



PTSD



"WHAT HAPPENED  
WASN'T THAT BAD. GET  
OVER IT."

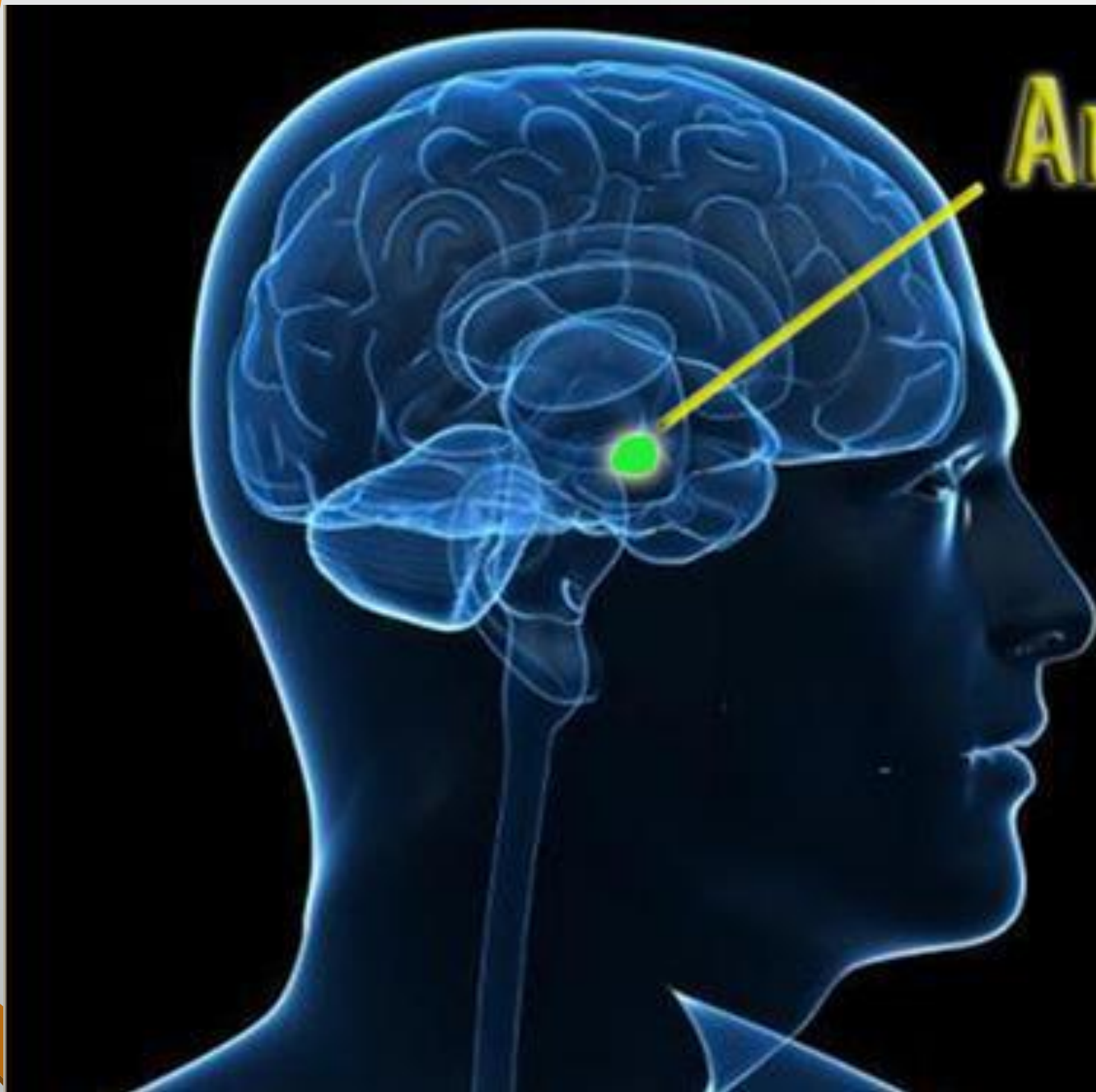
PTSD



# What is PTSD?

- People respond to a life-threatening event by fighting or fleeing.
- Potent chemical messengers in the brain warn people of danger and prepare them to defend themselves.
- If there's too much of this stimulation, or if it goes on for too long, the brain may suffer side effects. Some of these side effects appear to contribute to PTSD.
- PTSD is associated with changes in brain function and structure.
- There's also a tendency for key stress hormones to get out of whack.
- Research has shown that PTSD changes the biology of the brain.
- MRI (magnetic resonance imaging) and PET (positron emission tomography) scans show changes in the way memories are stored in the brain.
- PTSD is an environmental shock that changes a person's brain, and scientists do not know if it is reversible.
- Risk factors that may contribute to PTSD include a family history of anxiety, early separation from parents, earlier childhood abuse, or prior trauma.

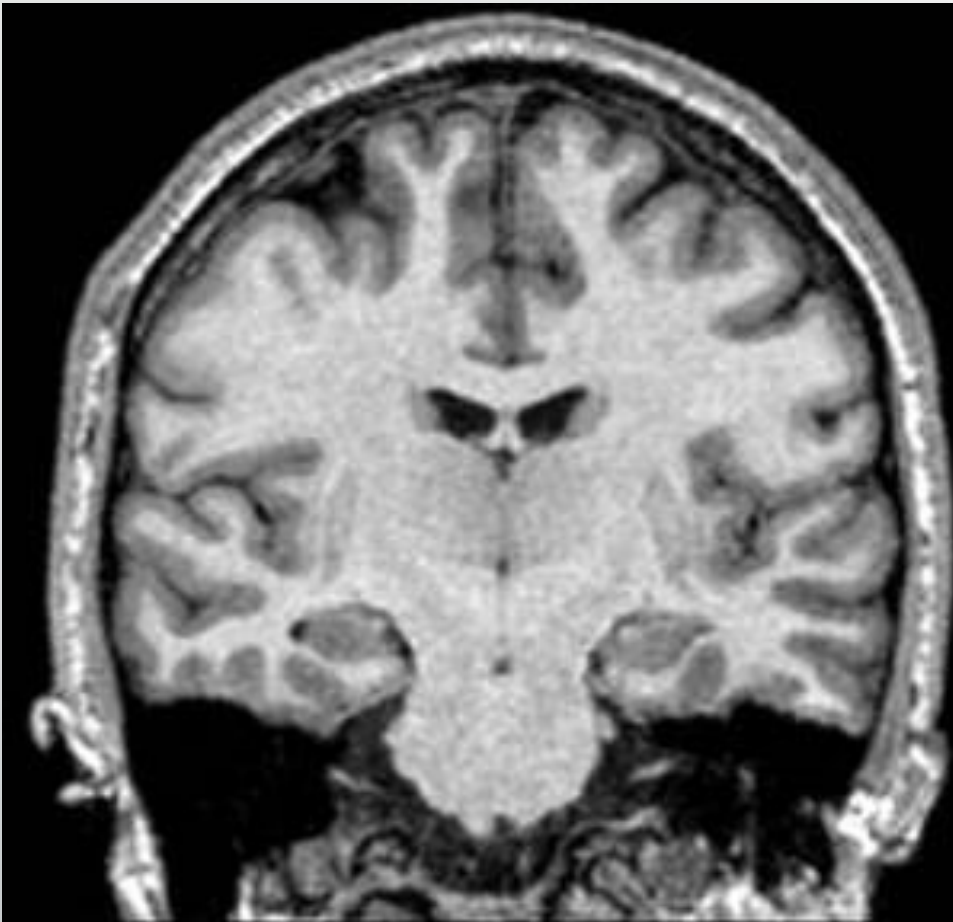
# Amygdala



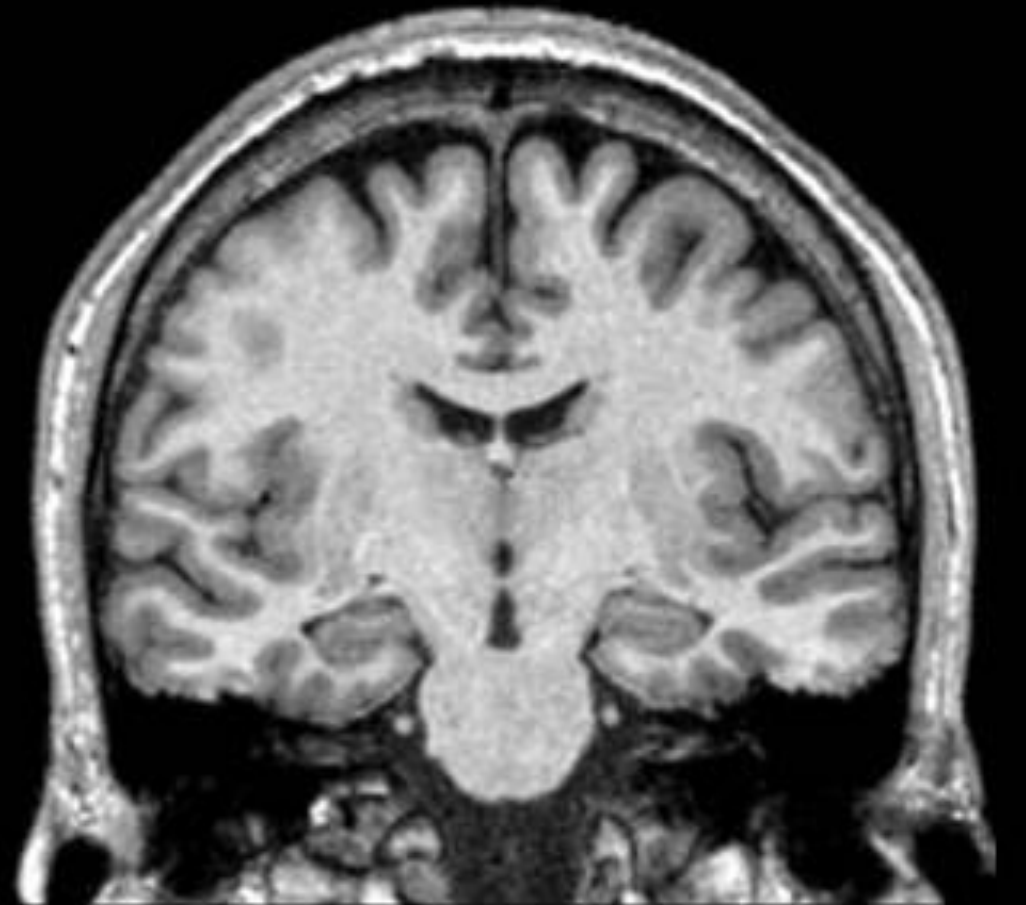
**A new study has found a link between PTSD and the size of the amygdala, which is connected to impulse control and fear response.**

# Who gets PTSD?

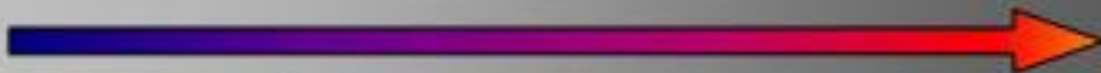
- In USA, 60% of men and 50% of women experience a traumatic event during their lifetimes. Of those, 8% of men and 20% of women may develop PTSD.
- A higher proportion of people who are raped develop PTSD than those who suffer any other traumatic event. Because women are much more likely to be raped (9% versus less than 1% for men), thus higher prevalence of PTSD in women than men.
- Some 88% of men and 79% of women with PTSD also have another psychiatric disorder. Nearly half suffer from major depression, 16% from other types of anxiety disorders besides PTSD, and 28% from social phobia. They also are more likely to have risky health behaviors such as alcohol abuse, which affects 52% of men with PTSD and 28% of women, while drug abuse is seen in 35% of men and 27% of women with PTSD.



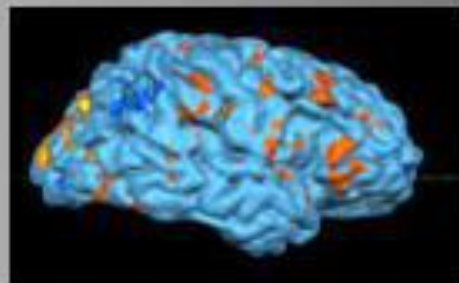
23 yr old Male  
Control



32 yr old Male  
PTSD +



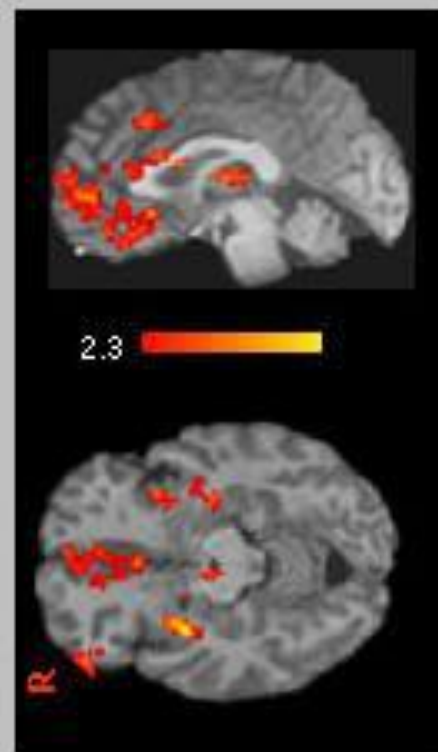
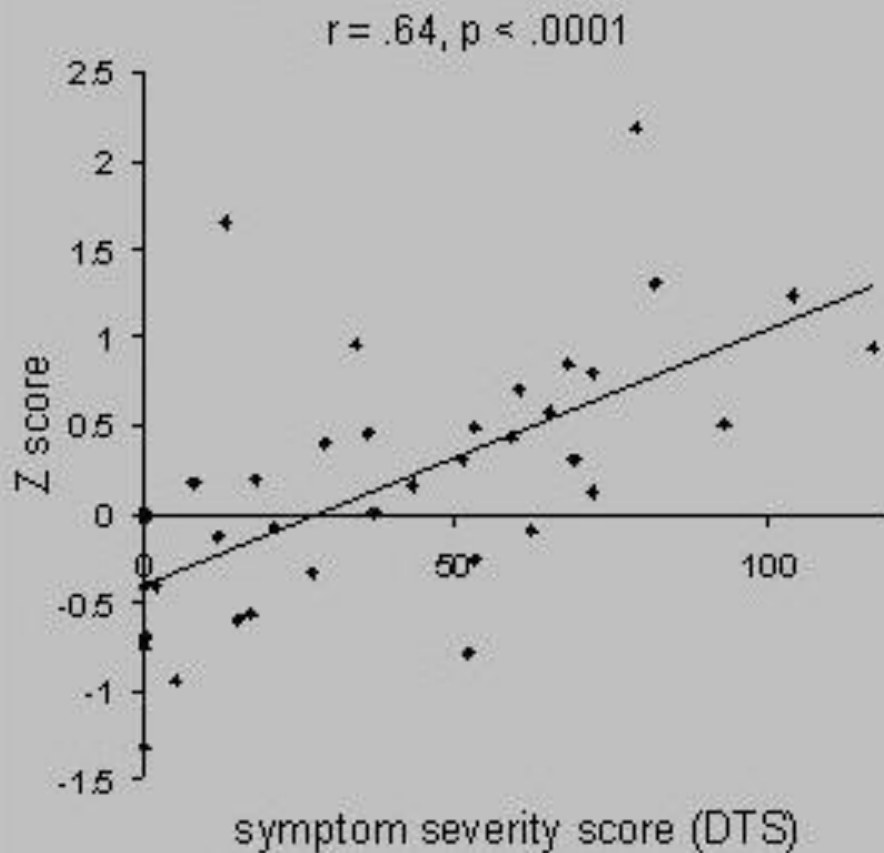
trauma



endophenotype

**PTSD**

disorder



# PTSD Changes your brain

## The Amygdala

The fear induced by trauma hypersensitizes it to danger. Everything becomes a threat.

The amygdala may increase in size.

## The Hippocampus

Converts short term memory to long term.

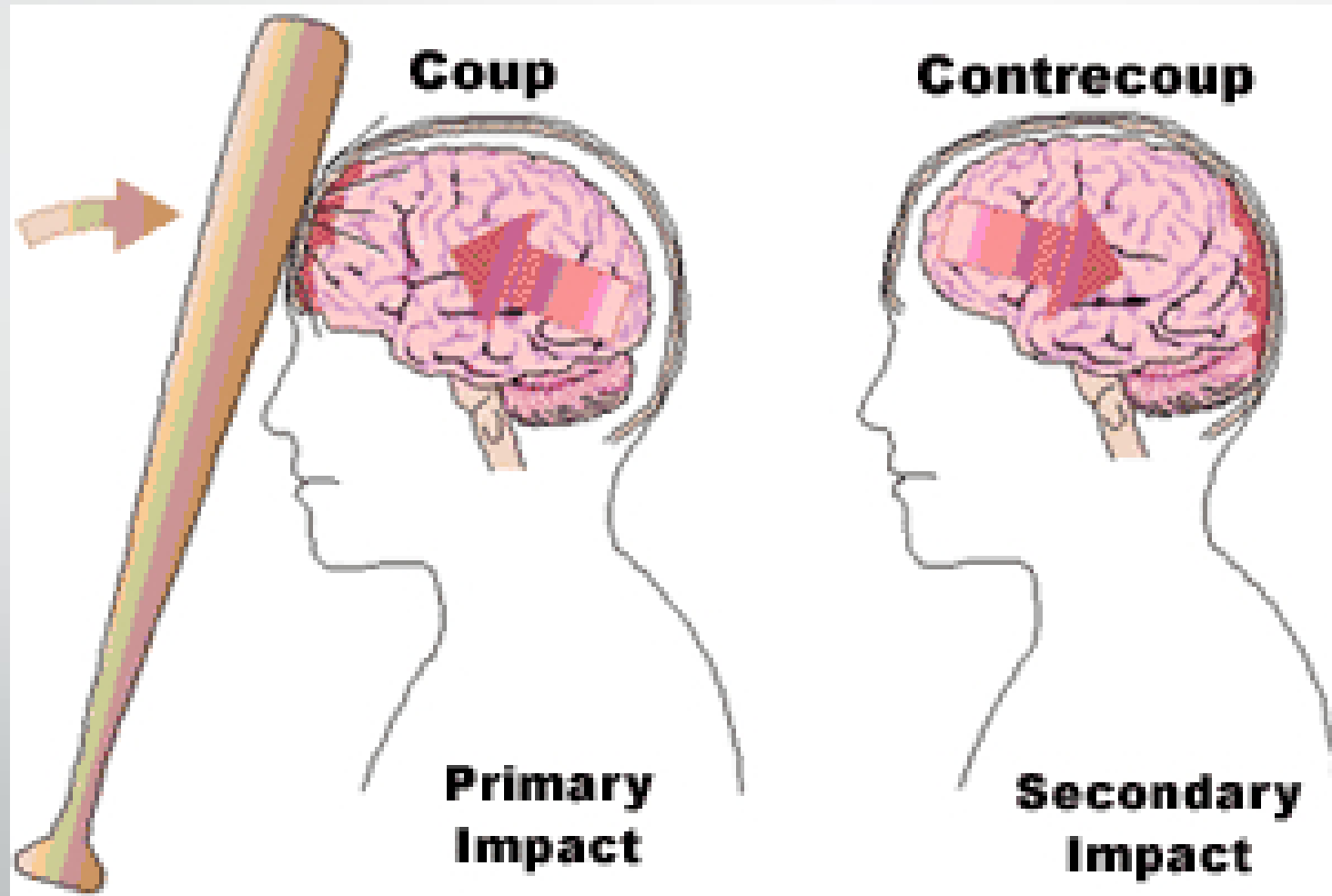
The hippocampus may shrink.

## The Prefrontal Cortex

Blood flow to left side may decrease with less ability for language and memory.

Blood flow to right side may increase causing more sorrow and anger

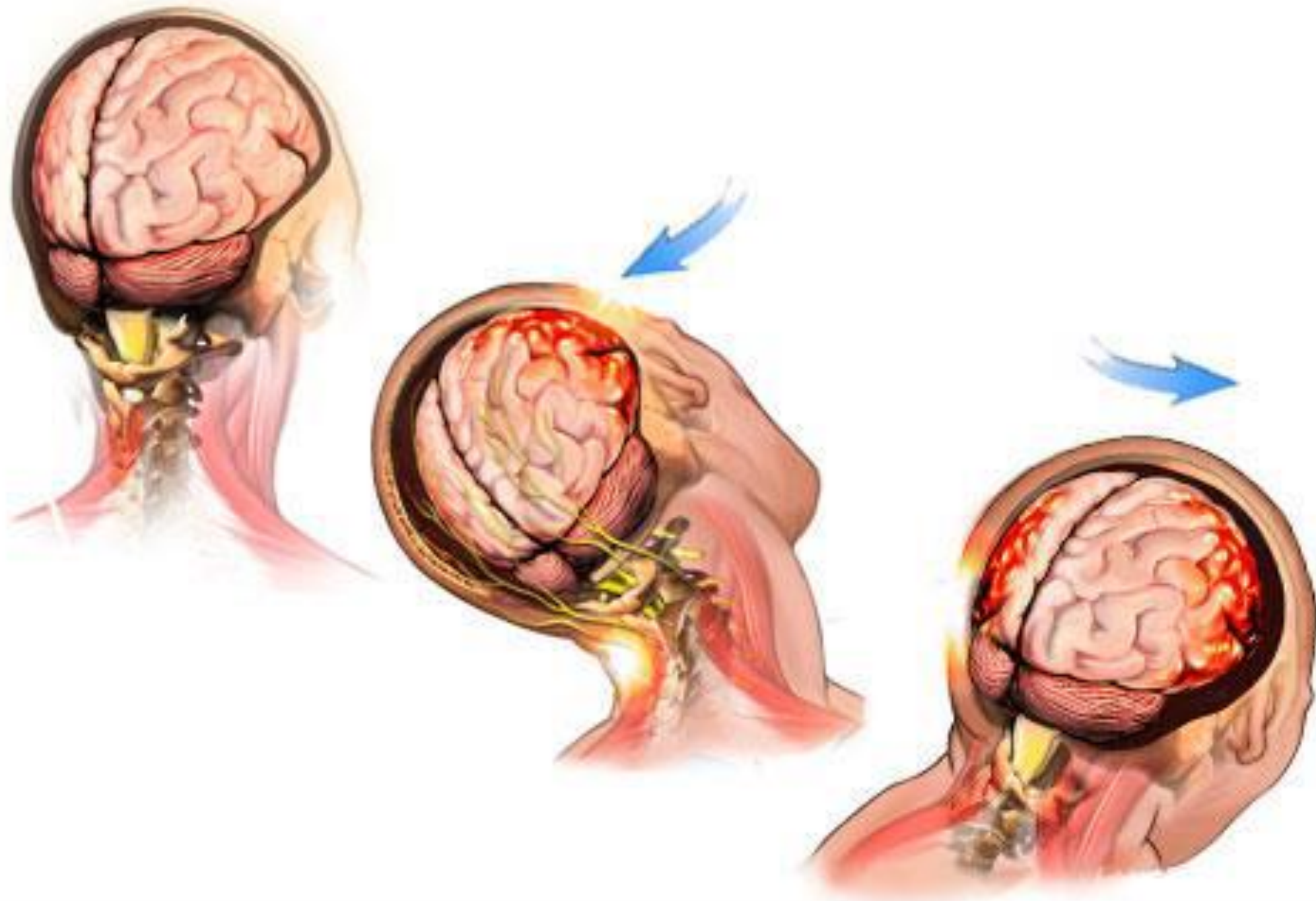
# TBI and mTBI



# What is TBI?

- A traumatic brain injury (TBI) can range from a mild concussion to a severe head injury.
- It is caused by a blow to the head or body, a fall, or another injury that jars or shakes the brain.
- This can cause bruising, swelling, or tearing of brain tissue.
- With rest, most people fully recover from a mild brain injury.
- But some people who have had a severe or repeated brain injury may have long-lasting problems with movement, learning, or speaking.
- For Veterans from OIF and OEF there is a strong likelihood that mTBI is comorbid with PTSD





# What is a Concussion?

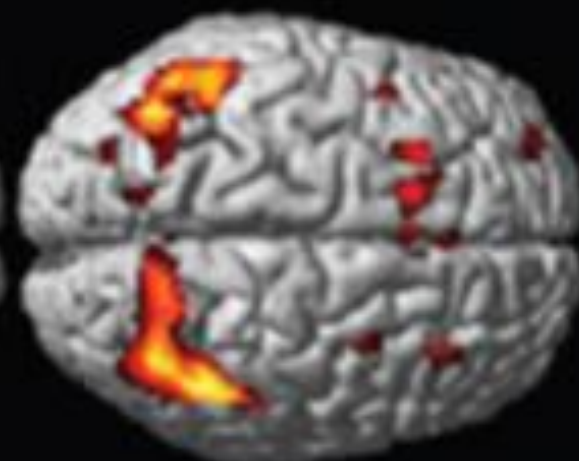
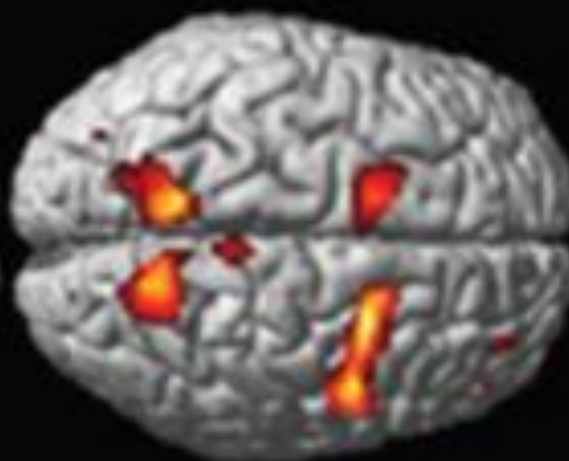
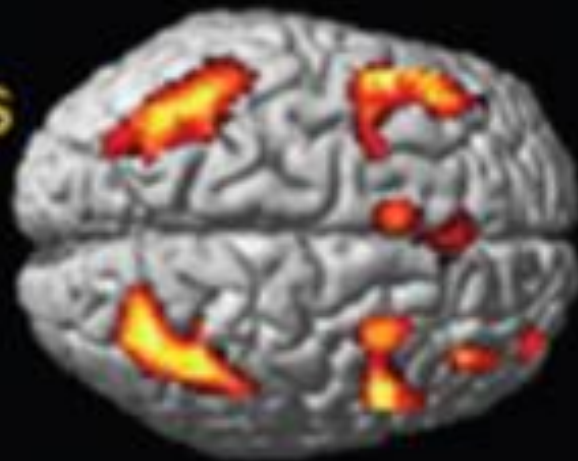
- A concussion is caused by a jolt that shakes the brain back and forth inside the skull.
- Any hard hit to the head or body --whether it's from a football tackle or a car accident --can lead to a concussion.
- Although a concussion is considered a mild brain injury, it can leave lasting damage if the person doesn't rest long enough to let the brain fully heal afterward.
- After a fall or hit to the head, the person may be knocked out for a few seconds.
- But many people with concussions do not black out.
- A few telltale symptoms will show that a person may have a concussion. Dizziness, nausea or vomiting, blurry vision, headache, and trouble thinking clearly are all signs that the person needs to see a doctor to get the head injury checked out.

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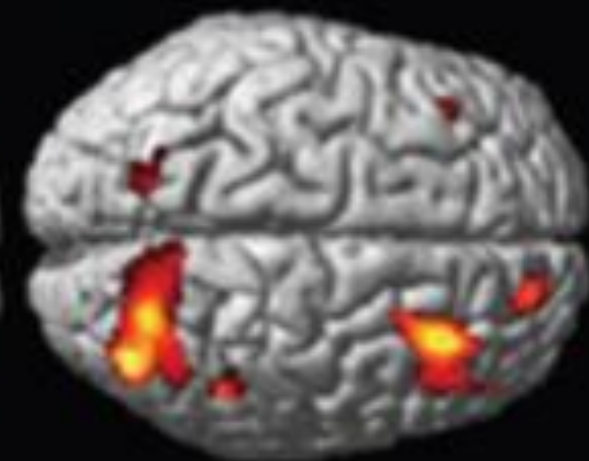
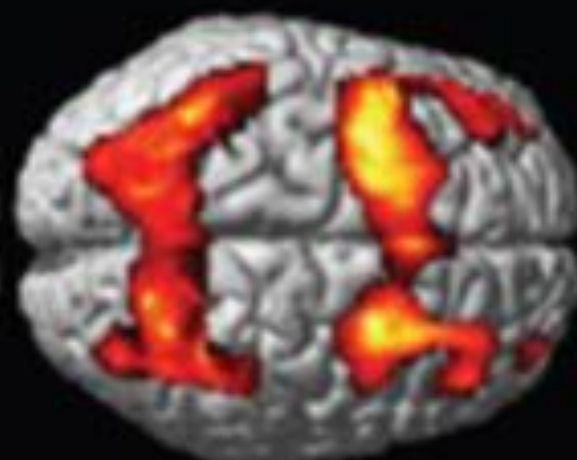
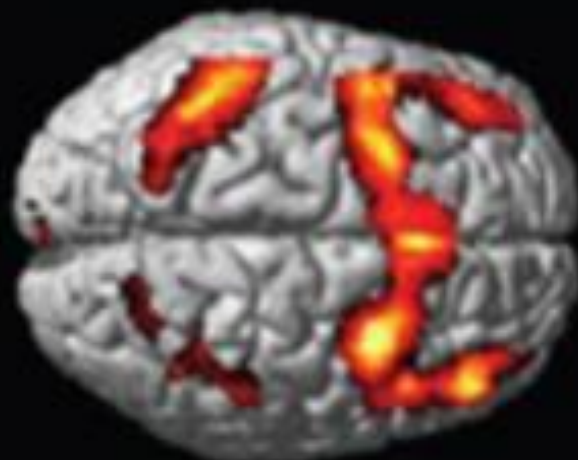
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Controls



MTBI



# What are the Symptoms of TBI?

- Symptoms of a traumatic brain injury range from mild to severe and can last for hours, days, weeks, or even months.

These symptoms may include:

- Not thinking clearly, or having trouble remembering new information.
- Having headaches, vision problems, or dizziness.
- Feeling sad, nervous, or easily angered.
- Sleeping more or less than usual.
- If a person develops these kinds of symptoms at any time after a head injury—even much later—they need to contact their doctor.

# CHRONIC TRAUMATIC ENCEPHALOPATHY

Tau Protein: Amygdala (McKee et al. 2009)

Healthy Brain

Football Player

Boxer

