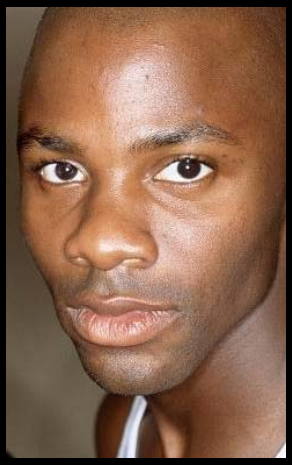
The Neurobiology of Trauma

David Lisak, Ph.D.



Why is it so crucial that we understand, prevent and effectively treat psychological trauma?

Trauma and violence are self-propagating

The Cycle of Violence

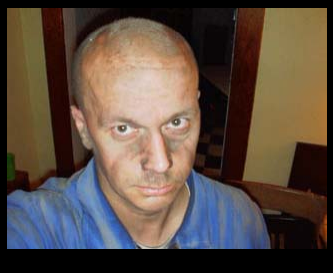
Childhood abuse significantly increases the risk that the abused child will themselves go on to be abusive or violent.

From Victim to Victimizer

Abused

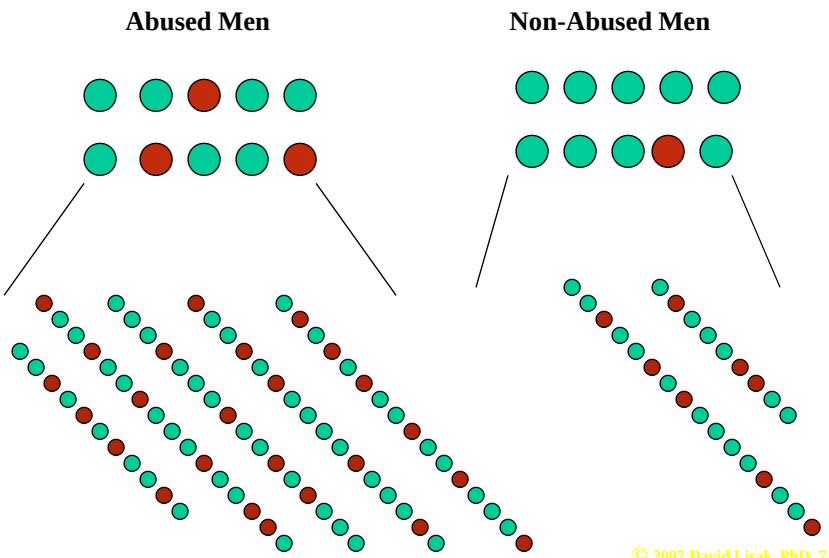
Learns to be tough

Hardened

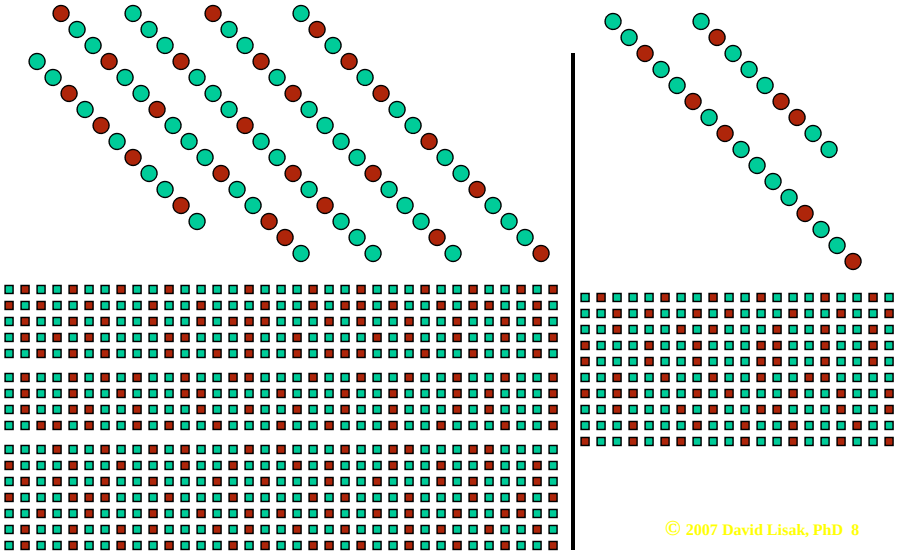


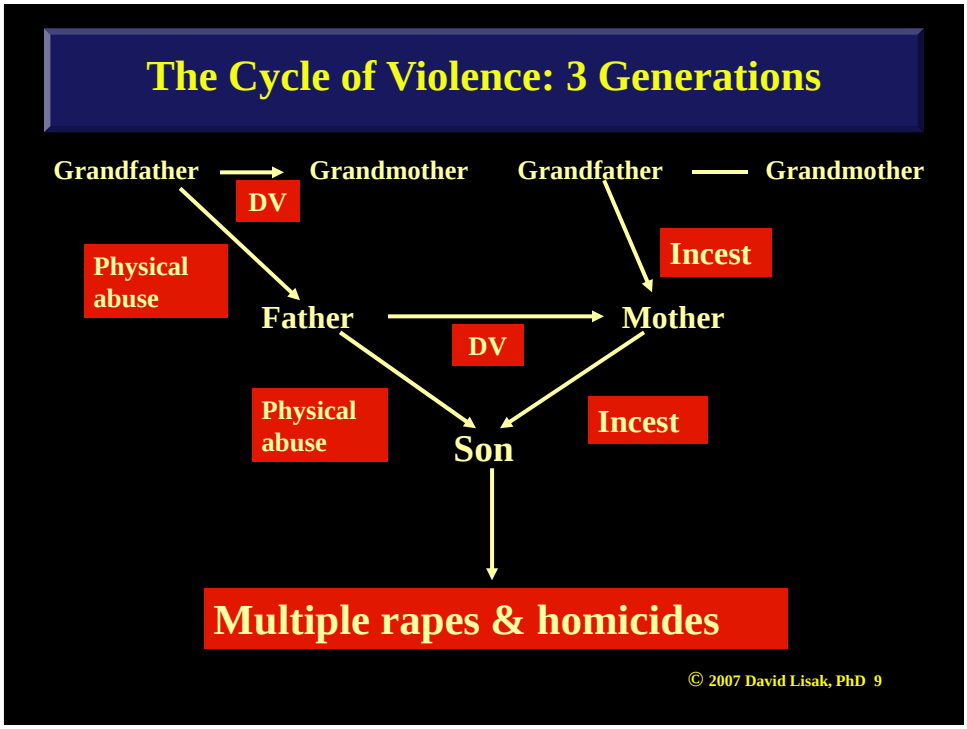
The Inter-generational Progression of the Cycle of Violence

If each perpetrator has 25 victims…



The third "generation"…




The Cycle of Violence: 3 Generations
Grandfather
Grandmother
Grandfather
Grandmother
DV
Physical abuse
Incest
Father
Mother
DV
Physical abuse
Incest
Son
Multiple rapes & homicides
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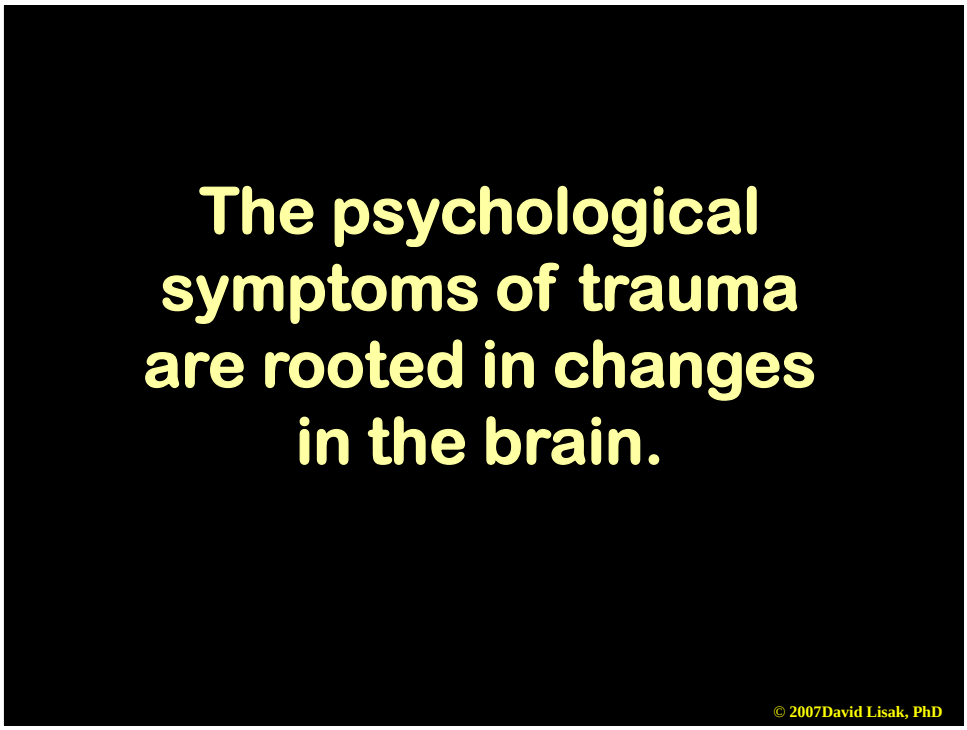
The psychological symptoms of trauma are rooted in changes in the brain.
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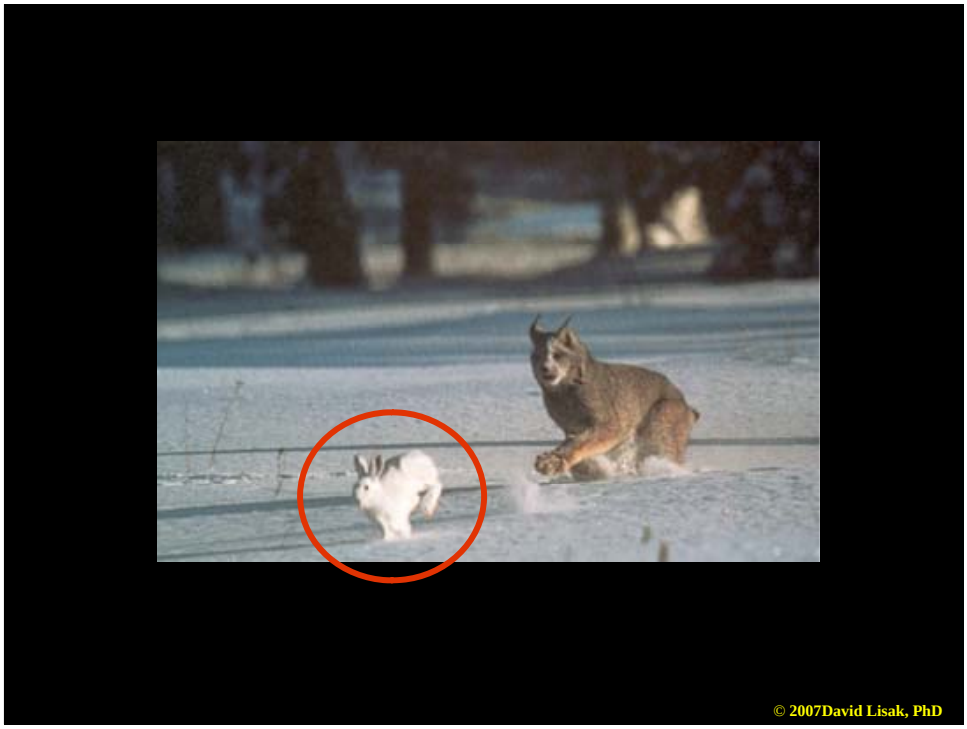
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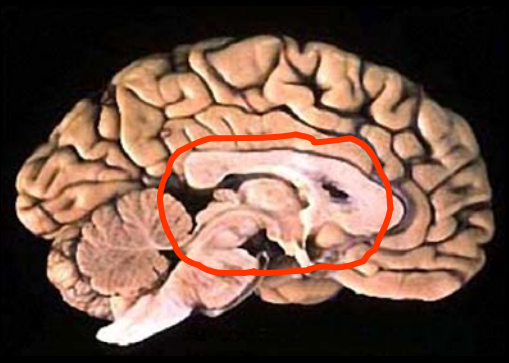
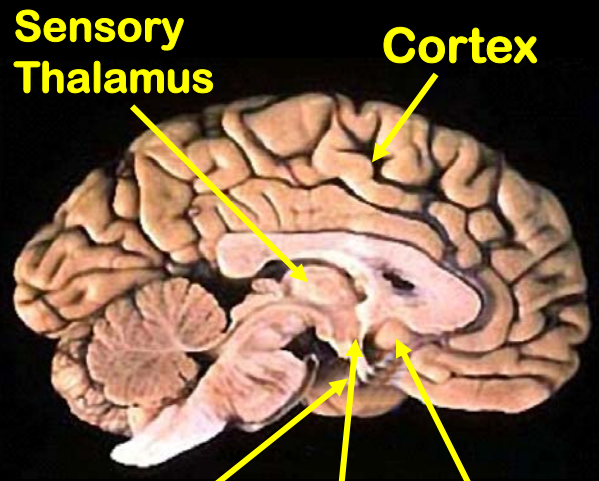
The Lesson

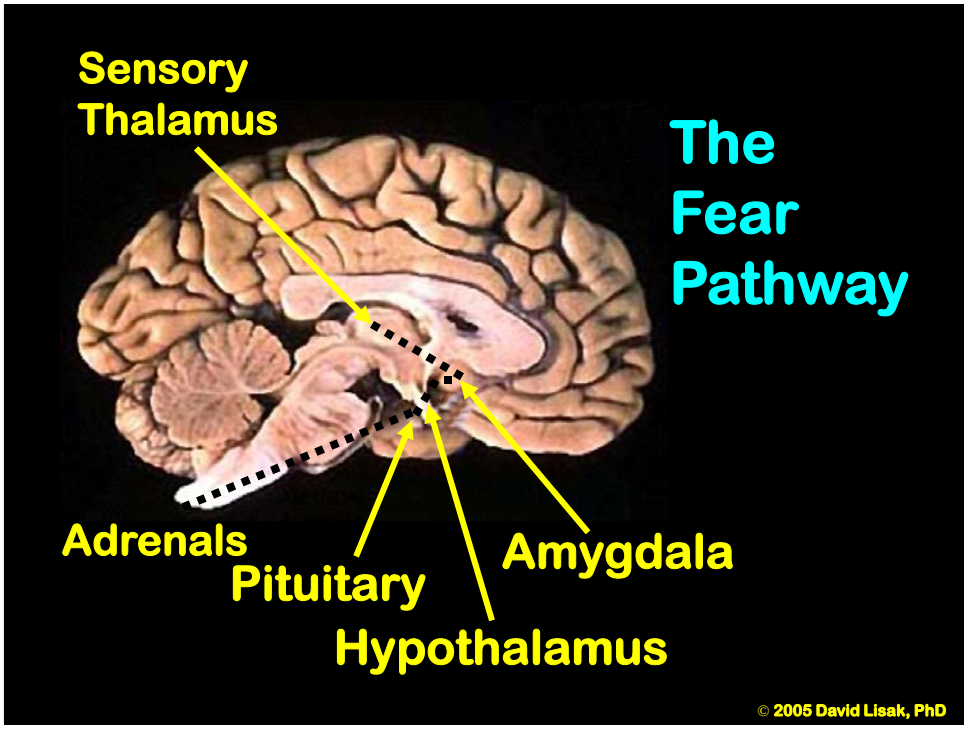


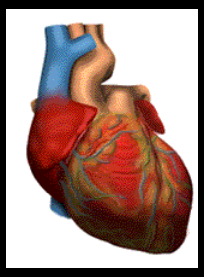
The human brain is a multi-layered map of millions of years of evolution

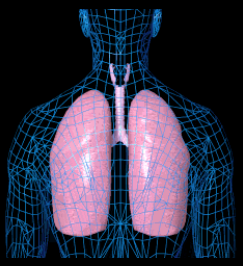
Our limbic structures are legacies of our mammalian & primate past

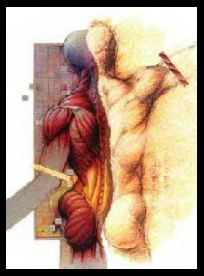


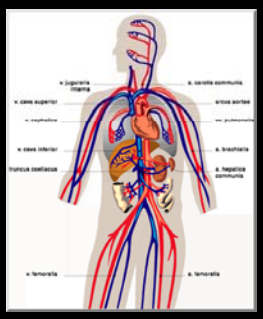
Critical Brain Structures in the Fear System


Sensory
Thalamus
The
Fear
Pathway
Adrenals
Pituitary
Hypothalamus
Amygdala
© 2005 David Lisak, PhD

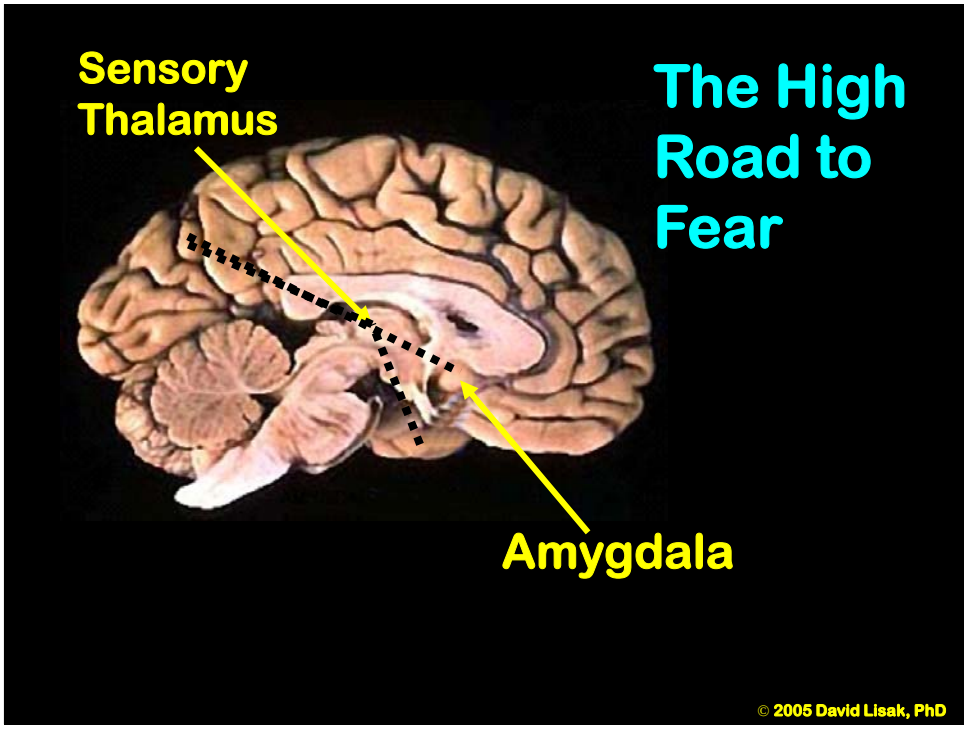








What would you experience if these two guys suddenly walked in the door to this room?


Sensory
Thalamus
The High
Road to
Fear
Amygdala
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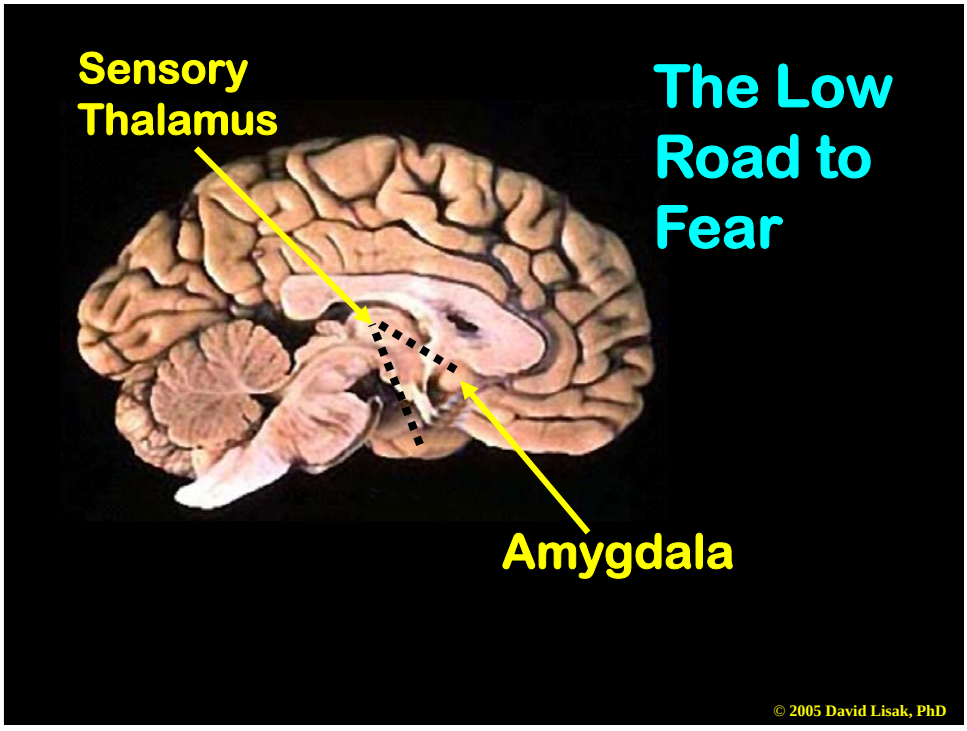
Sensory
Thalamus
The Low
Road to
Fear
Amygdala
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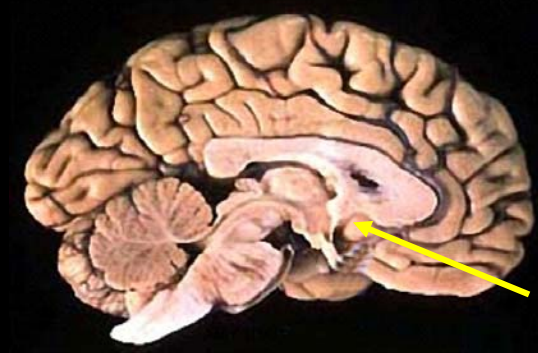
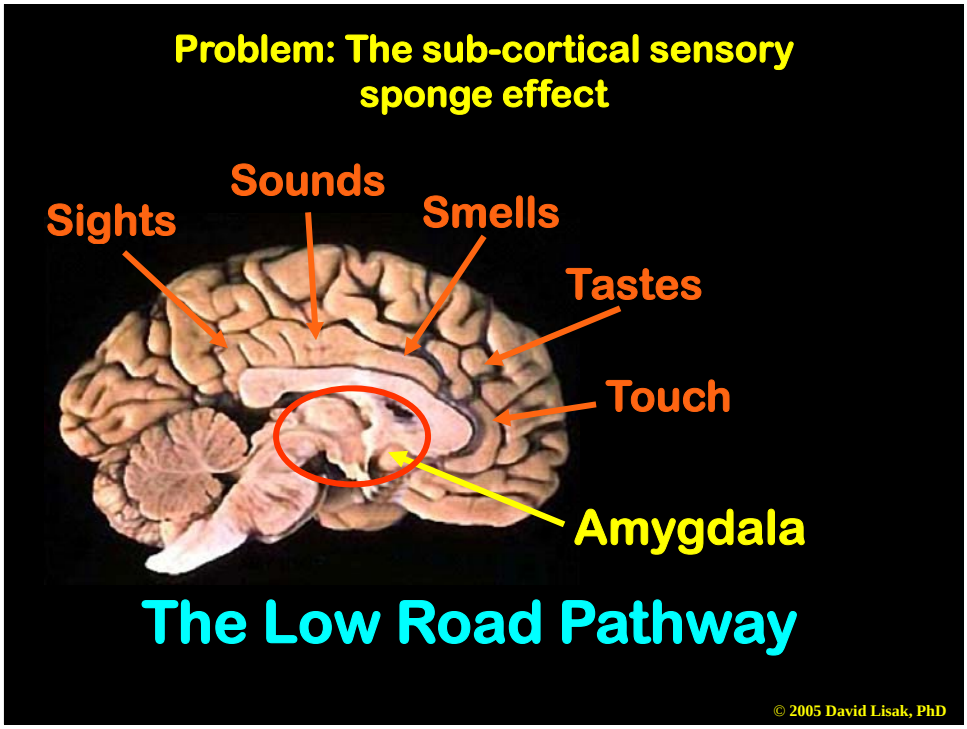
Why we need the Low Road pathway

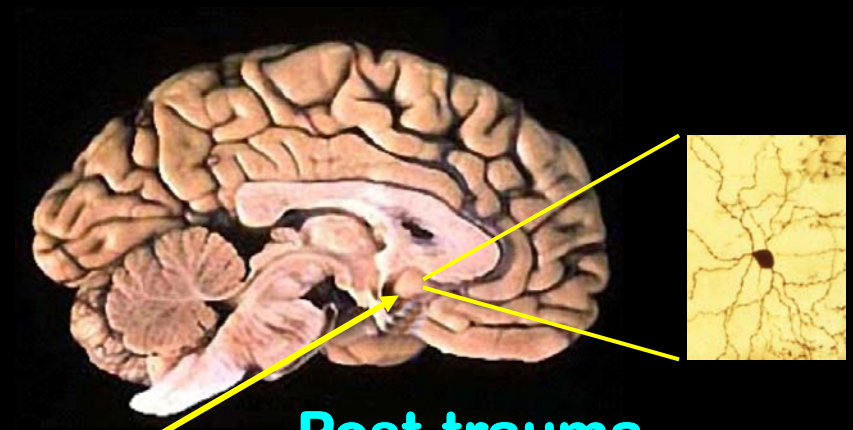
Problem: The sub-cortical sensory sponge effect



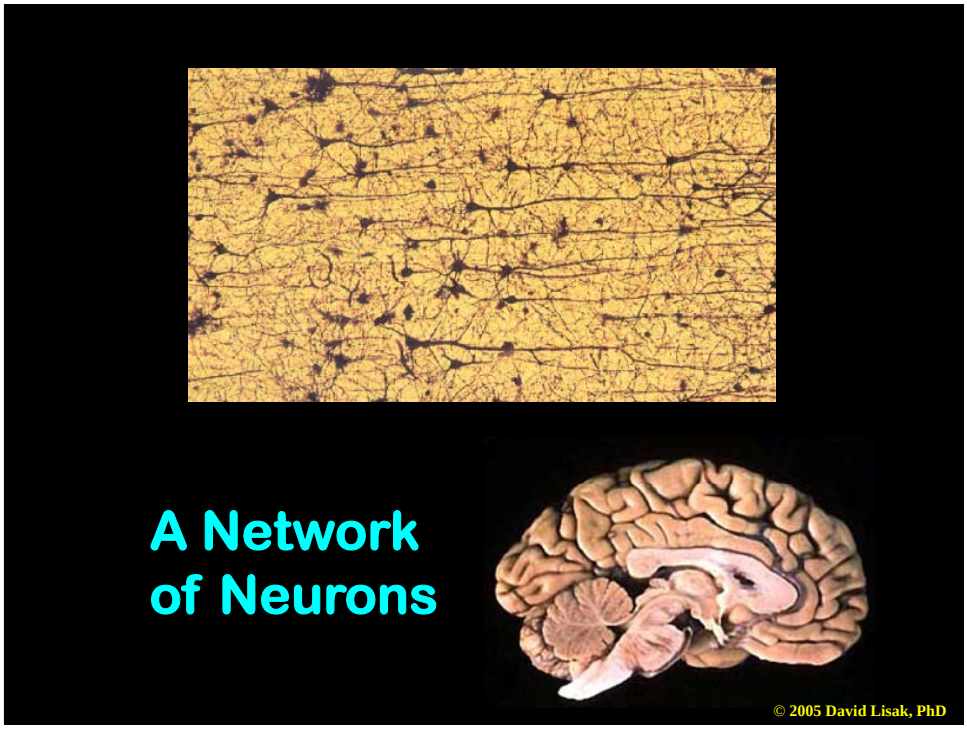
The Low Road Pathway

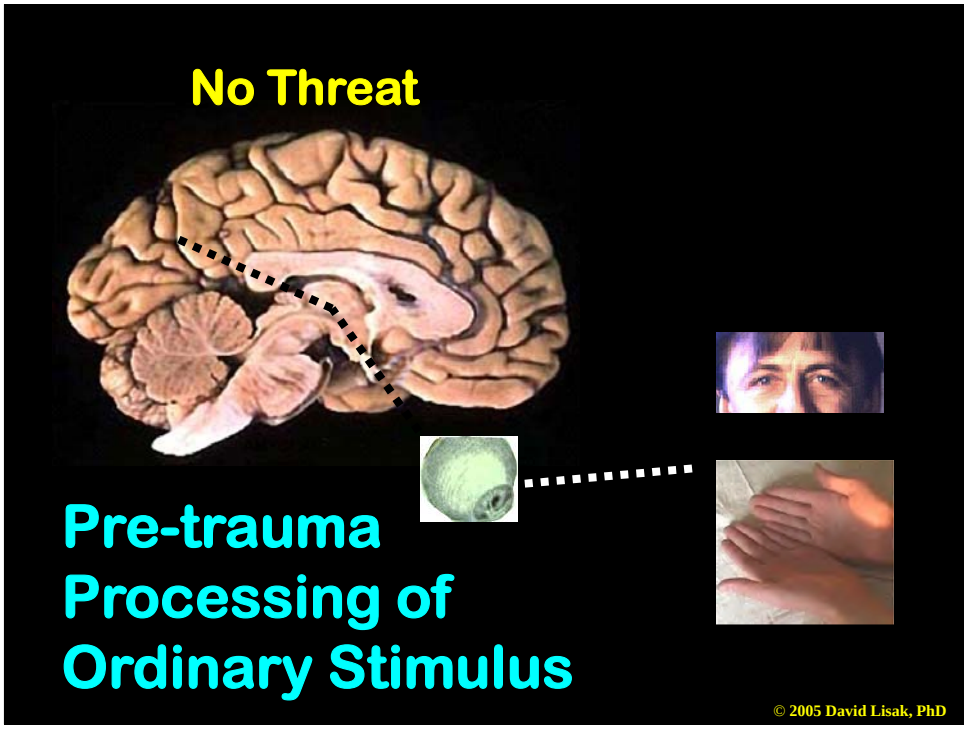

Problem: The sub-cortical sensory sponge effect
Sights
Sounds
Smells
Tastes
Touch
Amygdala
The Low Road Pathway
© 2005 David Lisak, PhD

When we say "encoded" what do we mean?



Post-trauma, Amygdala-based Fear Network


A Network
of Neurons
© 2005 David Lisak, PhD


No Threat
Pre-trauma
Processing of
Ordinary Stimulus
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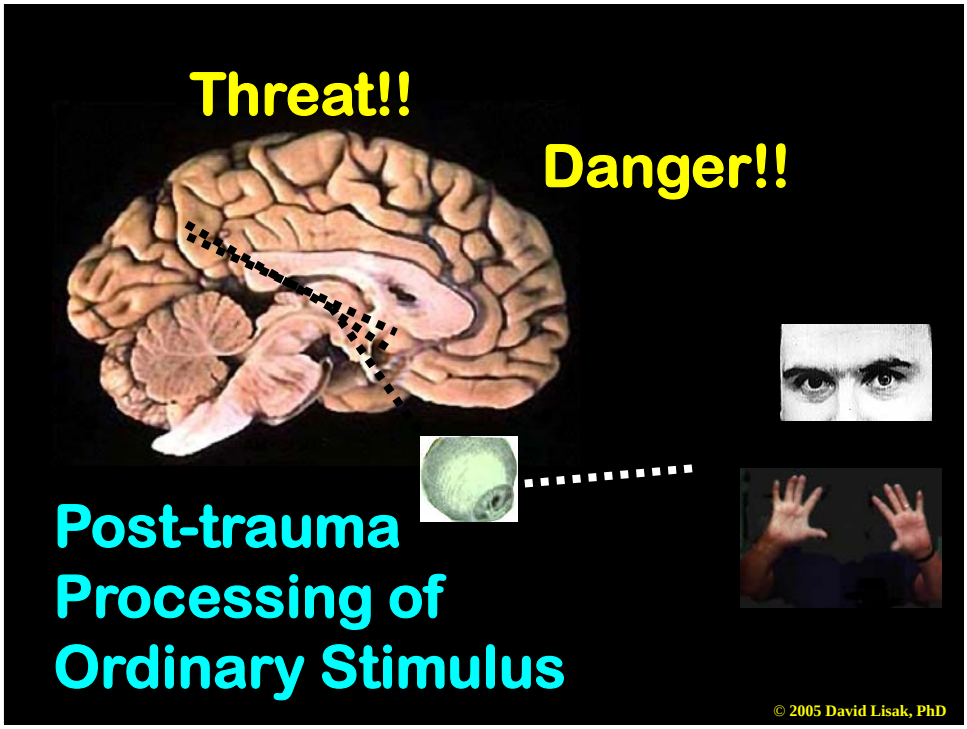
Threat!!
Danger!!
Post-trauma
Processing of
Ordinary Stimulus
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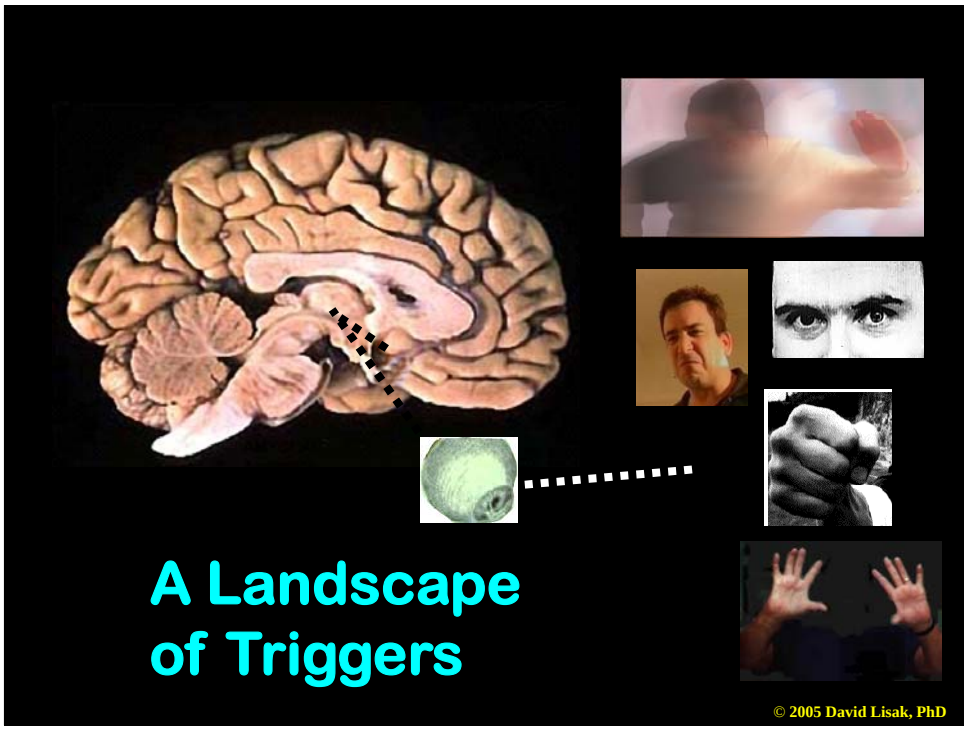
A Landscape
of Triggers
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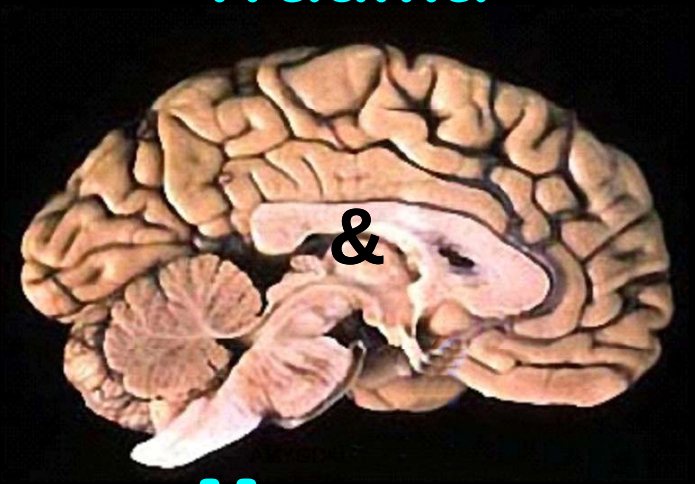
Trauma



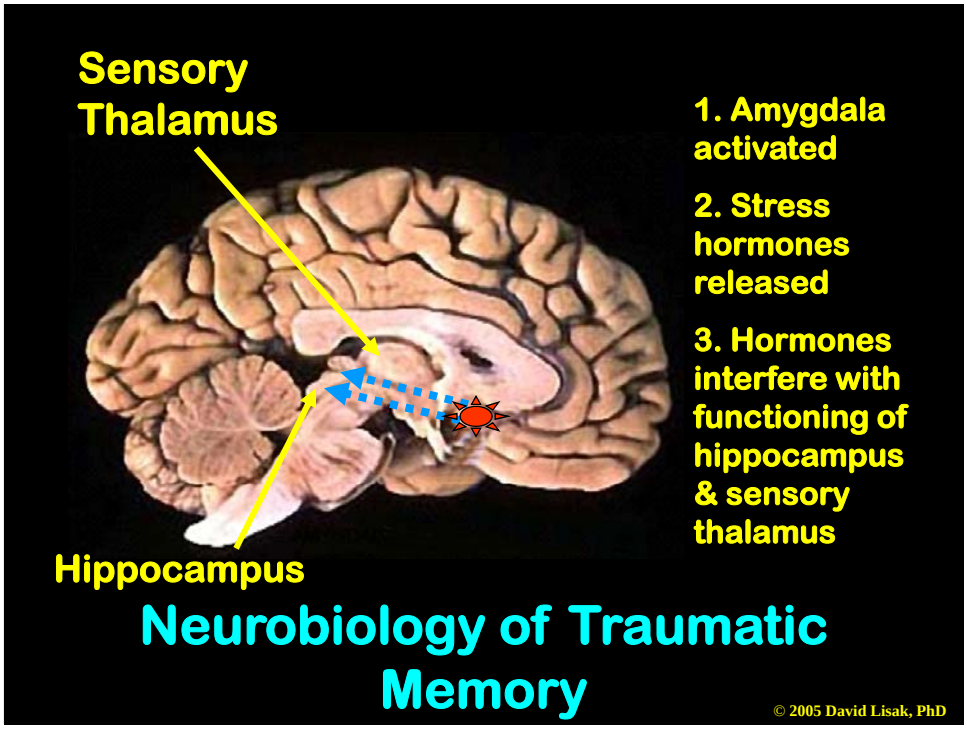
&

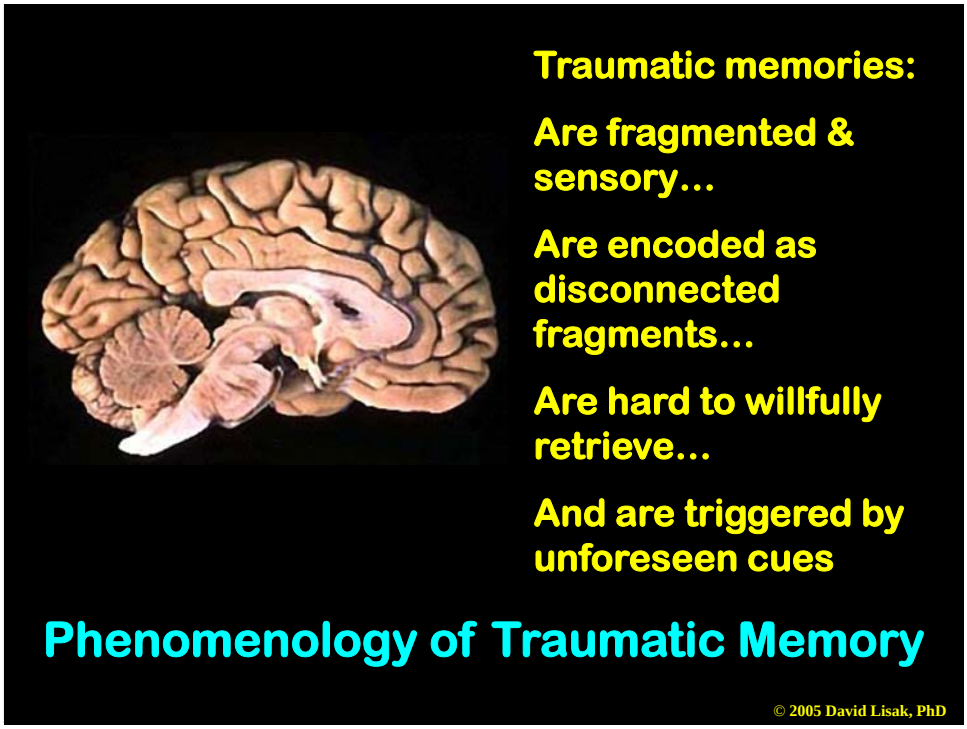
Memory

Seared into Memory

Tunnel Vision

Loss of Peripheral Detail


Sensory Thalamus
1. Amygdala activated
2. Stress hormones released
3. Hormones interfere with functioning of hippocampus & sensory thalamus
Hippocampus
Neurobiology of Traumatic Memory
© 2005 David Lisak, PhD


Traumatic memories:
Are fragmented & sensory…
Are encoded as disconnected fragments…
Are hard to willfully retrieve…
And are triggered by unforeseen cues
Phenomenology of Traumatic Memory
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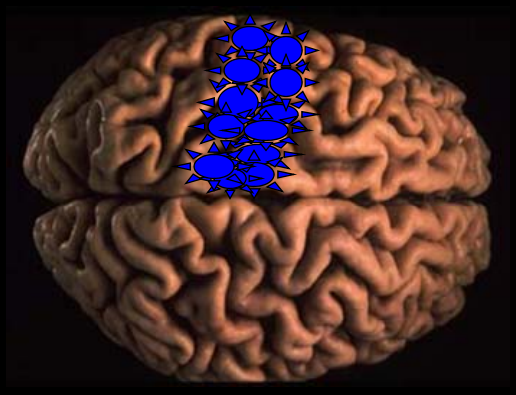
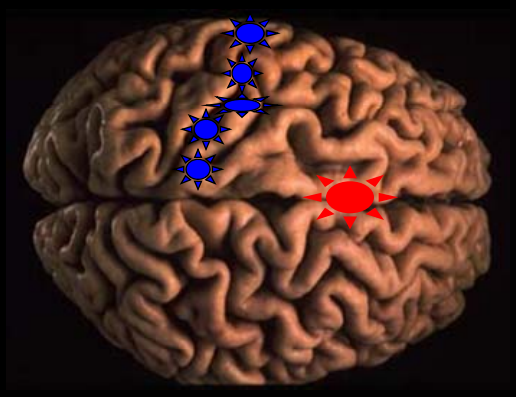
Traumatic memories are less easily translated into language



Trauma Victim: Non-trauma Script

"He opened the front door and smiled and I immediately recognized him as the man I had dated during my freshman year in college. I was thrilled to see him again and I couldn't believe it really…"

Rauch, et al. (1996). A symptom provocation study of posttraumatic stress disorder using positron emission tomography and script-driven imagery. *Archives of General Psychiatry, 53*, 380-387.



"He put his arm across my windpipe and I couldn't breathe and I started to really panic but I couldn't scream because I just couldn't – I could smell him, this smell that I can't get out of my mouth…"

Trauma Victim: Trauma Script

Trauma,

Memory & Language:

Lessons for Investigation

Trauma, Memory & Language: Lessons for Investigation

1. Don't push for what the victim cannot provide:
   - Sequence; context; peripheral details

Pushing for narrative context can lead to errors – guesses, assumptions – that can either be substantive or minor, but either way will be pounced on by defense attorney.

Trauma, Memory & Language: Lessons for Investigation

2. DO elicit raw data:
   - Sensory experience: sights, smells, sounds, etc.

Do you recall hearing anything? What do you recall hearing?

Do you recall smelling anything? What do you recall smelling?

Trauma, Memory & Language: Lessons for Investigation

3. Standard interrogation techniques DO NOT work well with trauma victims

E.g.: Asking victim to repeat narrative from different points in the sequence

E.g.: Asking victim questions designed to confuse/test their narrative

Problem: You can't determine whether inconsistencies are indicative of dissimulation or normal, traumatic memory.

Effects of Chronic Trauma on the Developing Brain

- Chronic trauma shapes the developing brain
- Brain becomes hyper-sensitive & hyper-reactive to trauma cues

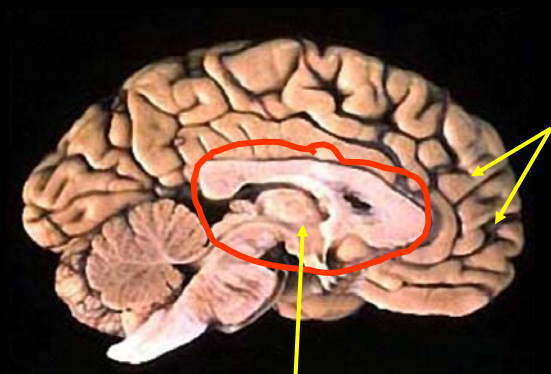
Effects of Chronic Trauma on the Developing Brain

Child's brain becomes hyper-sensitive to subtle facial indicators of threat.

Effects of Chronic Trauma on the Developing Brain

Child becomes prone to chronic hyper-arousal and hyper-vigilance.

Combined Effects of Chronic Trauma & Neglect



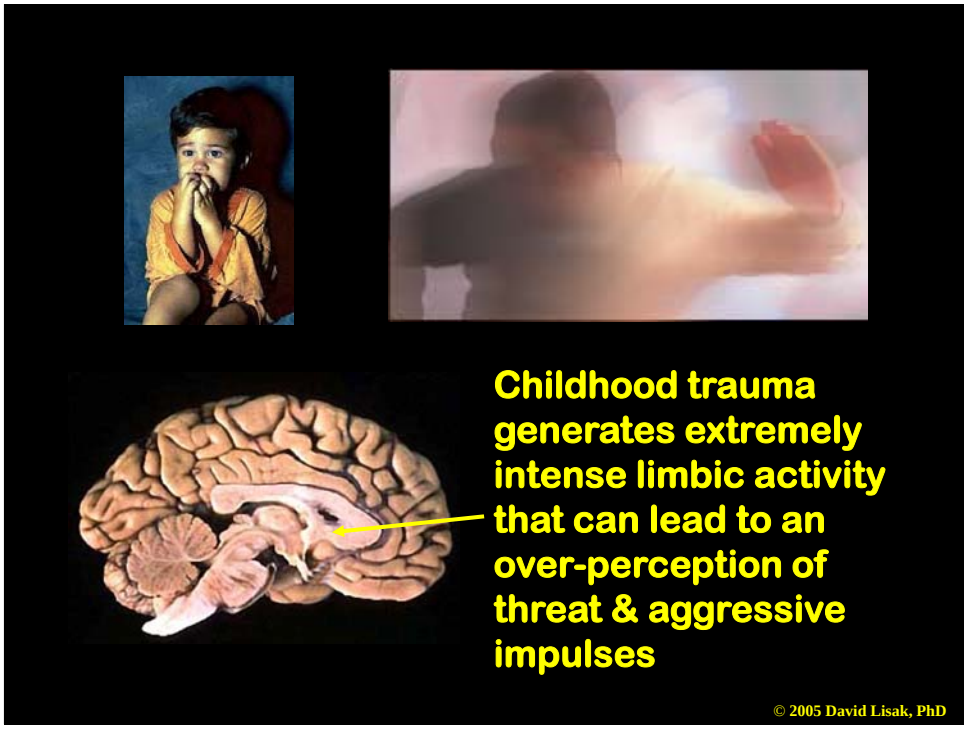
Frontal cortex: Source of impulse control & emotion regulation

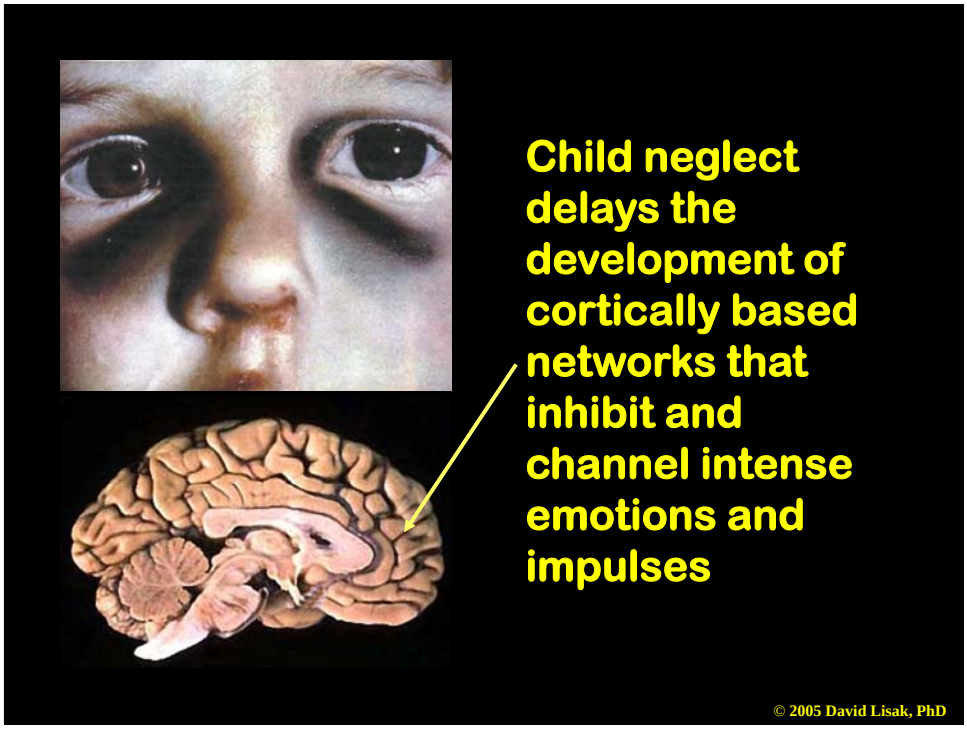
Limbic area: Source of intense emotions and impulses






How Cortical Inhibition Develops


Childhood trauma generates extremely intense limbic activity that can lead to an over-perception of threat & aggressive impulses
© 2005 David Lisak, PhD


Child neglect delays the development of cortically based networks that inhibit and channel intense emotions and impulses
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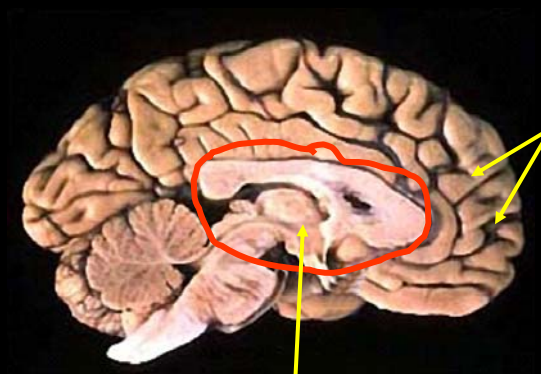
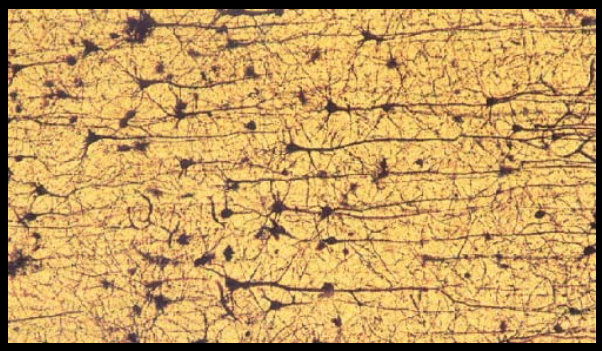
Combined Effects of Chronic Trauma & Neglect

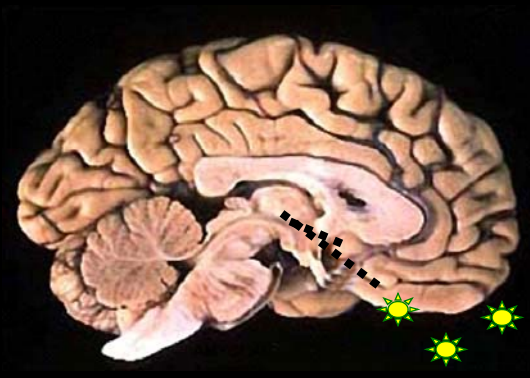


Frontal cortex: Weakened capacity for impulse control

Limbic area: Intensified emotions & impulses



The Longevity of trauma networks

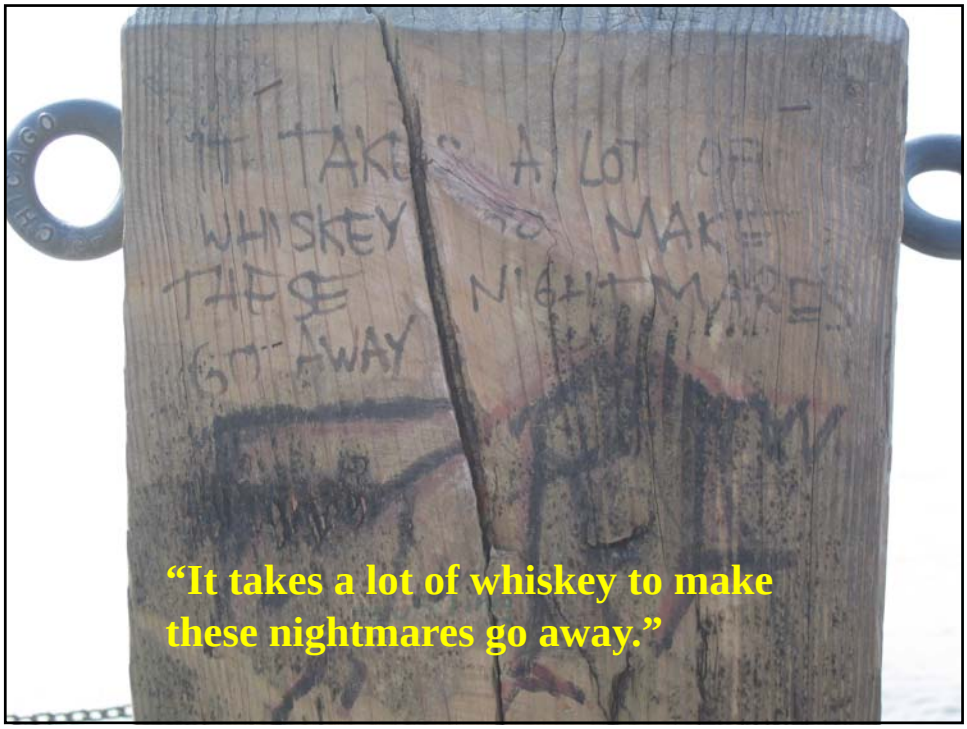


Fear network triggered by molecules of lemon grass

Anatomy of a 25-year Old Memory

Inter-generational Transmission of Trauma

Self-medication



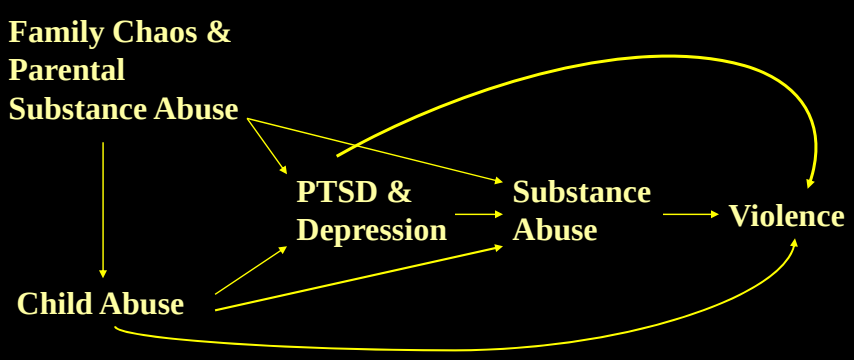
"It takes a lot of whiskey to make these nightmares go away."

The Trauma-Substance Abuse Cycle

Self-medication

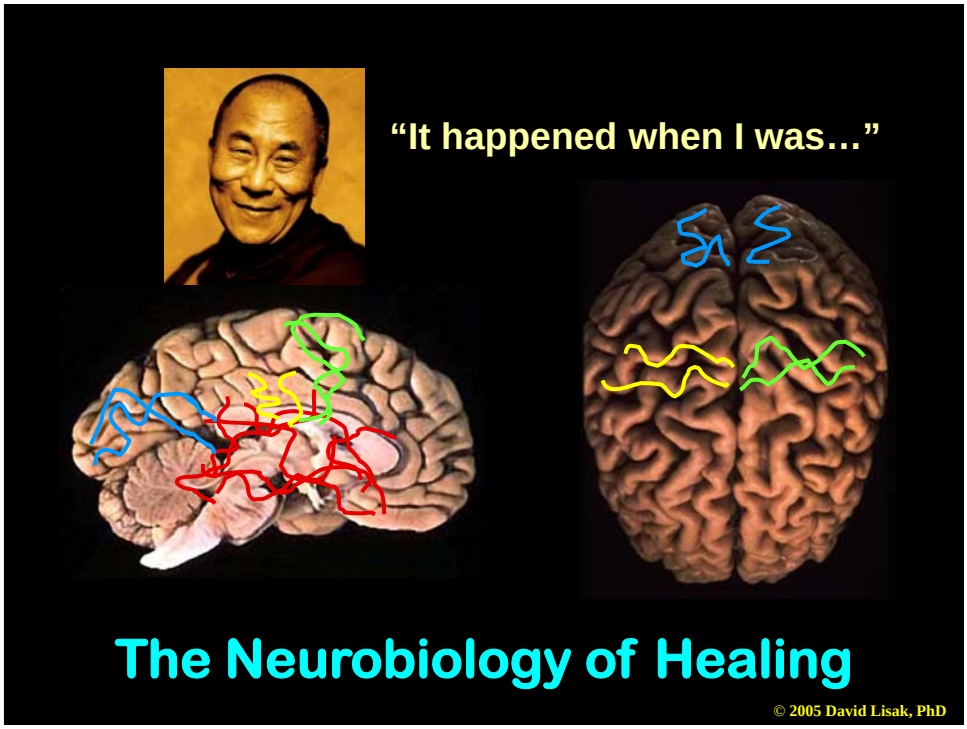
1. Trauma symptoms in need of medication:
   - PTSD; anxiety; depression; despair
2. "Medications" available:
   - Alcohol as general psych. anasthetic
   - CNS depressants to calm physiological hyperactivity
   - Meth., cocaine, etc. as anti-depressants & to combat chronic fear states

Pathways to Violence



These relationships confirmed by scores of studies.

The Neurobiology of Healing


"It happened when I was…"
The Neurobiology of Healing
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Can we borrow from the model of brain injury rehabilitation?
The Neurobiology of Healing
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