

Module 4

The Neurobiology of Trauma and Sexual Assault



OVCTTAC
OFFICE FOR VICTIMS OF CRIME Training and Technical Assistance Center

Learning Objectives

- Describe the basic components of the brain related to trauma.
- Explain common ways the brain is affected during and after sexual assault.
- Recognize common ways a traumatic experience may affect a victim's behavior.
- Assist victims in understanding the neurobiology of trauma, when appropriate.

The Brain...



Disclaimer

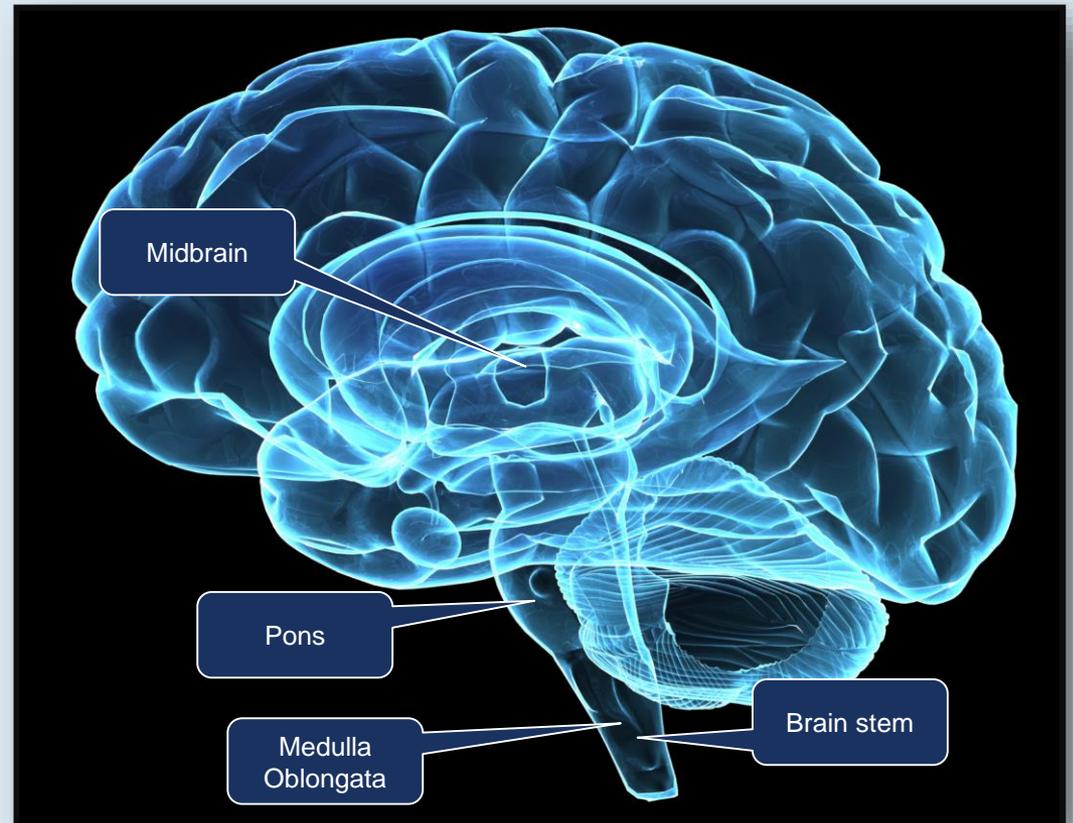
Please note that some mental health professionals, agencies, or entities may or may not agree with models of the neurobiology of trauma, as scientific knowledge, models, and theories are rarely unanimously accepted.

Module Overview

- The brain and its basic functions.
- The prefrontal cortex of the brain.
- Key circuitries in the brain affected by trauma.
- Emotional and brain responses when confronted with a traumatic situation.
- Traumatic events and memory.
- How knowledge of neurobiology can assist crime victims.

The Brain's Basic Functions

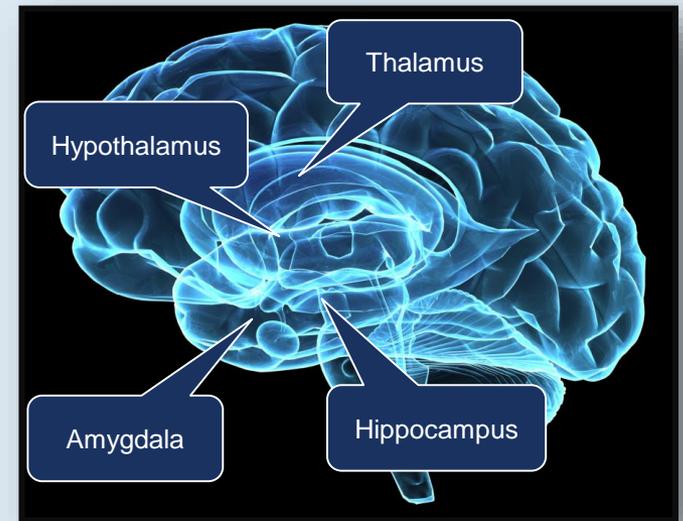
- Brain stem.
- Medulla oblongata.
- Pons.
- Midbrain.



The Limbic System

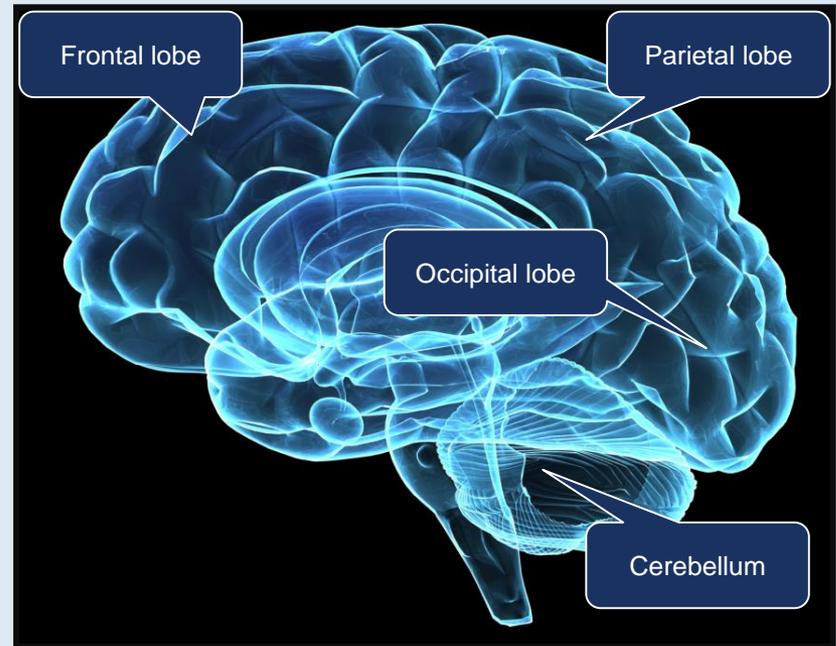
A complex set of structures that lies on both sides of the thalamus, just under the cerebrum, which includes the:

- Amygdala.
- Thalamus.
- Hypothalamus.
- Hippocampus.



The Cerebellum and Cerebrum

- The cerebellum:
 - ◆ Associated with regulation and coordination of movement, posture, balance.
- The cerebrum:
 - ◆ Associated with reasoning, movement, and visual processing.



The Prefrontal Cortex



The Prefrontal Cortex

- Holds thoughts and memories in mind.
- Helps us manage emotions and reflect on behavior.
- Helps manage other brain regions.
- Allows us to focus our attention where we choose, and do what we choose, consistent with our goals and values.
- Becomes impaired in traumatic situations.



Fear Circuitry

- Plays a huge role in trauma and posttraumatic stress.
- Located in multiple brain areas.
- Operates automatically and mostly outside awareness.



Seeking Circuitry

- Seeks escape from fear, anxiety, sadness, and any unwanted experiences.
- May be “quick fixes” that don’t solve the problem and may lead to addiction.
- Also enables victims to seek to uphold their values.



Satisfaction Circuitry

- Produces feeling of satisfaction when we get what we seek.
- Central to feeling safe, soothed, and connected to others.
- Produces opioids involved in feelings of satisfaction, connection, etc.

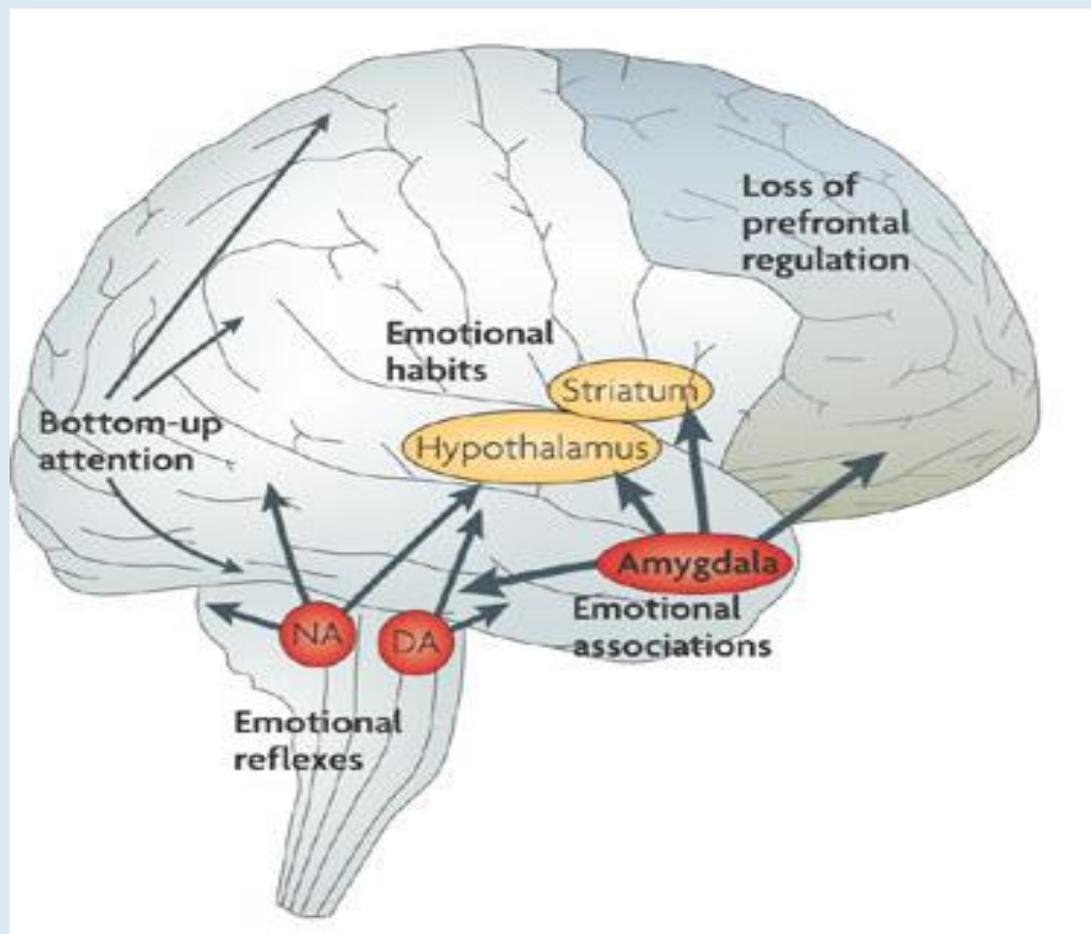


Embodiment Circuitry

- Includes the insular cortex (insula).
- Receives sensory data from all body systems.
- Key to healing from trauma.
- Allows us to know what it feels like to be in our body.



Traumatic Situations: Amygdala Control



Source of diagram: Amsten 2009, *Nature Reviews Neuroscience*, 410.

In Traumatic (and High-Stress) Situations...

- Loss of prefrontal regulation: Chemicals from the brain stem impair (and may shut down) the prefrontal cortex.
- Bottom-up attention: Attention is automatically captured by anything perceived as dangerous or threatening, or as necessary for survival.
- Emotional reflexes: Reflexes are automatic and include freeze, flight, or fight responses, as well as bodily responses like your heart pounding quickly.

The Amygdala and Attention



Survival Reflexes in the Body



Pupils dilate.



Heart beats faster.



Blood pressure increases.



Blood flow to muscles increases.



Breathing rate increases.

“Fight or Flight” is Misleading

- Our brains are not wired this way.
- We evolved to freeze first, then flee.
- Fighting is only in the service of fleeing, unless there is no other option.
- It's important that assault victims understand this, because many will be ashamed that they did not fight back.

Freeze, Flight, or Fight—Primary Purpose

- Freeze:
 - ◆ Brief response, when danger is perceived.
 - ◆ Highly alert.
 - ◆ Not moving.
 - ◆ Ready to suddenly burst into action.



Drastic Survival Reflexes

- Occur when escape is—or appears—impossible.
- Attempting to escape and survive when there is no (physical) escape.
- Automatic survival reflexes.

Disassociation—Drastic Survival Reflex

“It was silence, looking at her
through a glass wall,
so it couldn't affect me, couldn't touch me.”



Disassociation—Drastic Survival Reflex

- Victim feels:
 - ◆ “Spaced out.”
 - ◆ “Disconnected.”
 - ◆ “On autopilot.”
- These are common responses to sexual abuse in children, although it can happen to anyone.



Disassociation—Drastic Survival Reflex

Explain to victims that these are brain-based, automatic survival reflexes.



Tonic Immobility—Drastic Survival Reflex

- Freezing = Alert and immobile, but able to move.
- Tonic immobility = Paralysis, can't move or speak.
- Caused by extreme fear, physical contact with perpetrator, restraint, perception of inescapability.
- An estimated 10–50 percent of victims experience tonic immobility.



Tonic Immobility—Drastic Survival Reflex

- Sudden onset and termination.
- Lasts from seconds to hours.
- Does not impair alertness or memory.



Tonic Immobility—Drastic Survival Reflex

Can overlap with disassociation and may include:

- Trembling or shaking.
- Rigid muscles.
- Feeling of cold.
- Numbness to pain.
- Unfocused staring or intermittent eye closure.



Collapsed Immobility—Drastic Survival Reflex

Heart gets massive parasympathetic input, resulting in:

- Extreme decreases in heart rate and blood pressure.
- Faintness, “sleepiness,” or loss of consciousness.
- Loss of muscle tone.



Collapsed Immobility—Drastic Survival Reflex (continued)

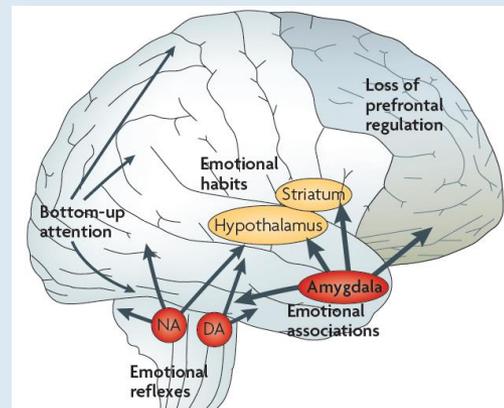
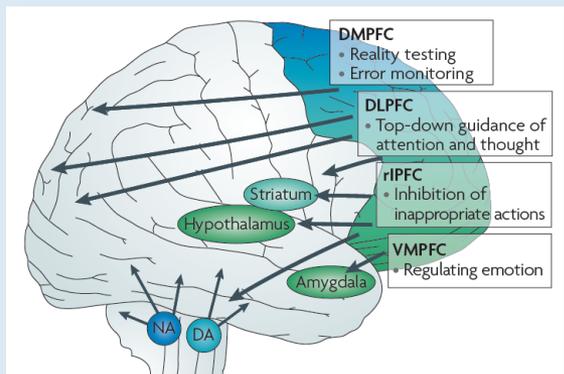
- Often accompanies mental defeat.
- Can be triggered by seeing blood, a skin puncture, or a knife.
- More likely in women.
- Can be a source of shame in victims.
- These are normal, brain-based responses.

(Kozłowska et al. 2015;
Baldwin 2013)

Brain-Based “Counter-Intuitive Behaviors”

- Did not resist.
- No attempt to escape.
- Did not scream.
- “Active participant.”

Brains During Most Sexual Assaults



Perpetrator

- Not stressed.
- **Prefrontal cortex in control.**
- Thinking and behavior:
 - Planned.
 - Practiced.
 - Habitual.

Victim

- Terrified, overwhelmed.
- **Fear circuitry in control.**
- Attention and thoughts driven by perpetrator actions.
- Behavior controlled by emotional reflexes and habits from childhood (including abuse).

Activity



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Response Scenarios Case Studies Worksheet 4.1

- Work in groups.
- Review the case studies and answer the questions.
- Report out to the large group.

The Brain During Trauma

- Brain releases high amounts of stress chemicals.
- High amygdala activity.
- Strong encoding of emotional and sensory memories.
- Prefrontal cortex is impaired, including language protection area.

Hippocampus Function Altered

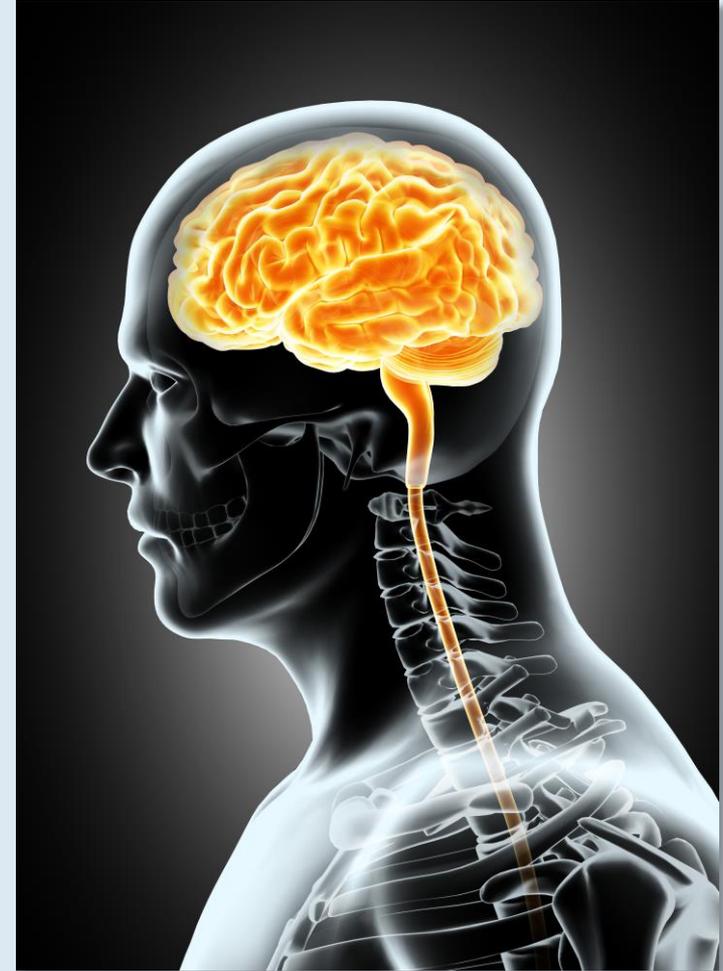
- Context of assault and elements of event are poorly woven into a whole.
- Sequence of events is poorly encoded.

However...

- Emotional memories are well encoded, especially for experiences surrounding the onset of fear/terror.

Attention, Trauma, and Memory

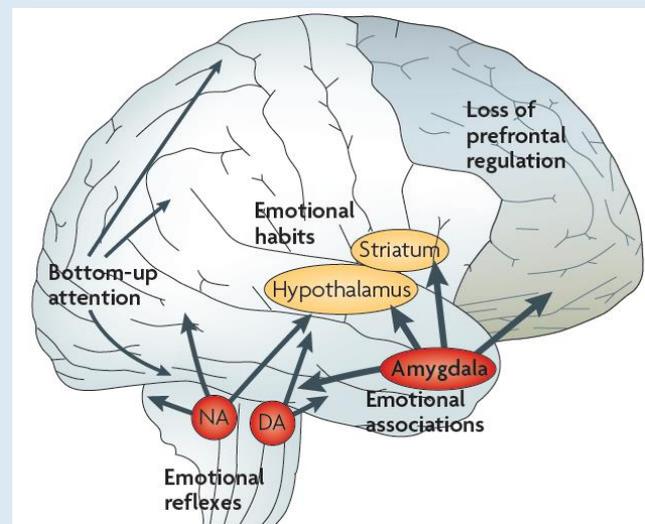
- Mostly bottom-up attention.
- Fear circuitry focused on what seems most important to survival and coping.
- Central details are encoded.
- Stimulus information is encoded much more than contextual information.



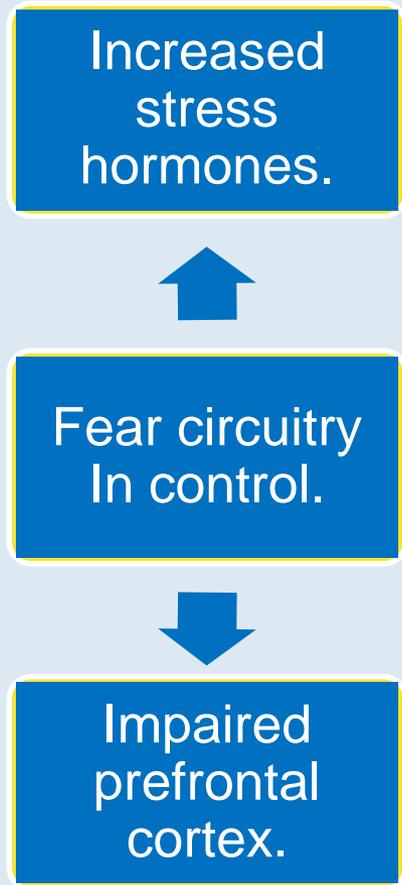
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What Gets Encoded Into Memory

- Fragments of experience are “burned in.”
- “Islands of memory.”
- Few peripheral details.
- Little or no time-sequence information.
- Little or no words or narrative.

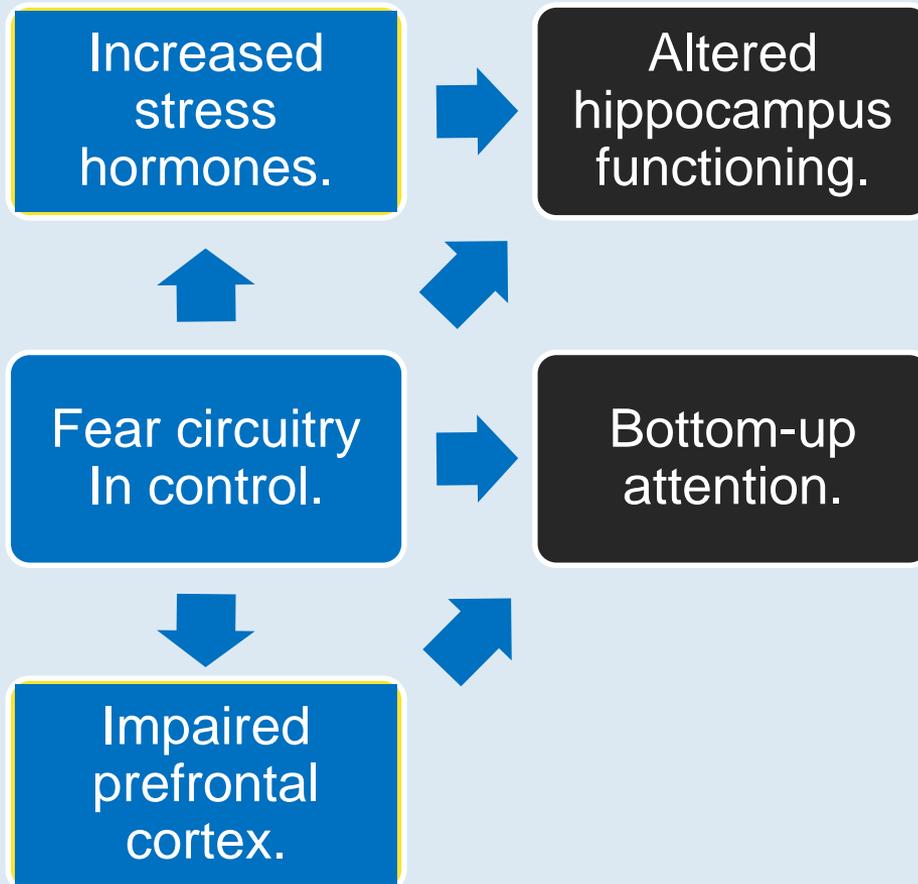


What Gets Encoded Into Memory



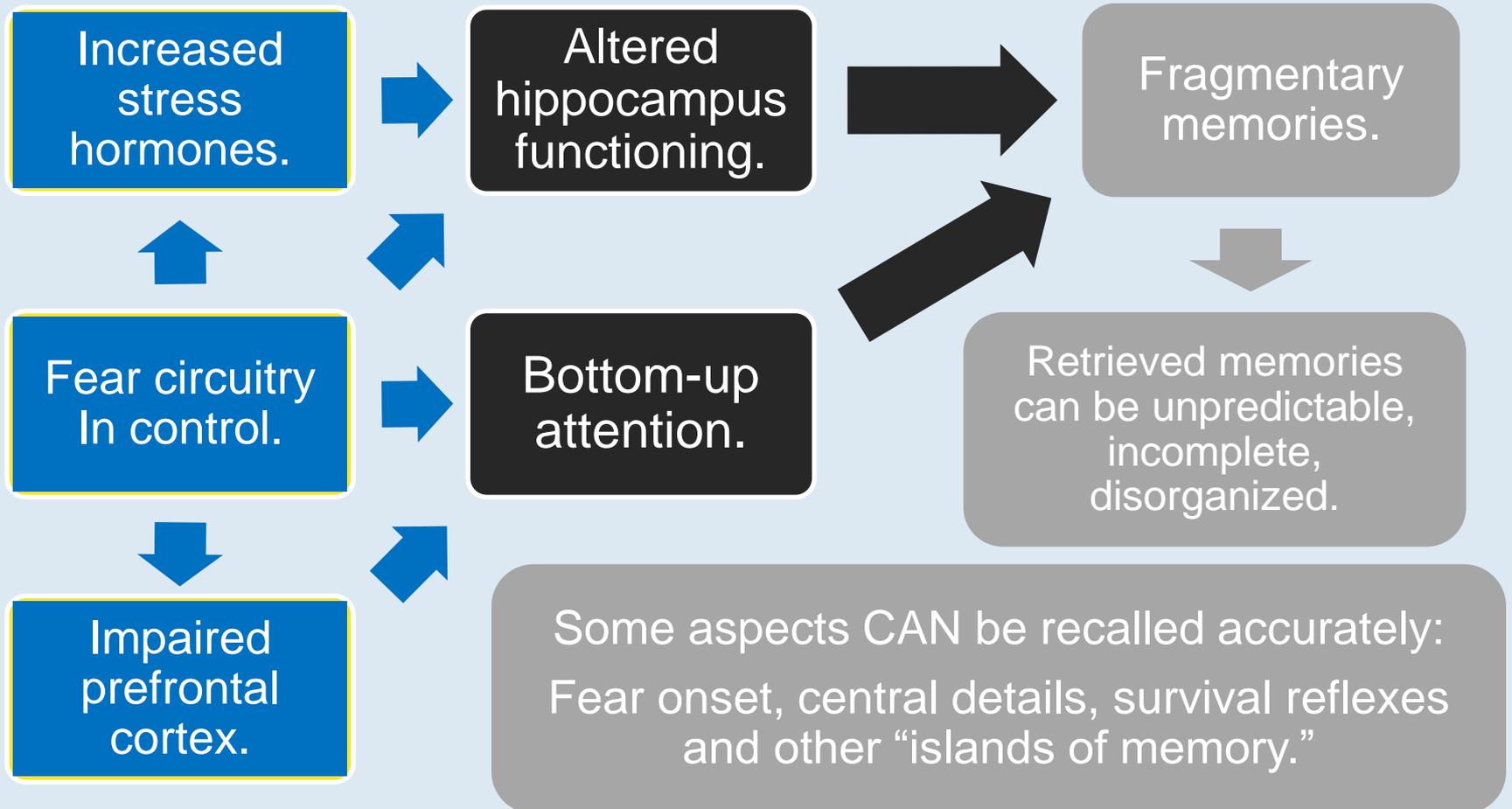
(Schwabe et al. 2012; Joels et al. 2012)

What Gets Encoded Into Memory



(Schwabe et al. 2012; Joels et al. 2012)

What Gets Encoded Into Memory



(Schwabe et al. 2012; Joels et al. 2012)

“Islands of Memory”

- Micro-islands—Fragmentary sensations.
- Larger islands—Key periods within assault.
 - ◆ When fear kicked in, right before and after.
- Survival reflexes—Indicators of nonconsent:
 - ◆ Freezing.
 - ◆ Disassociation.
 - ◆ Tonic immobility.
 - ◆ Collapsed immobility.



Alcohol, Drugs, and Memory

- Low to moderate dose/intoxication:
 - ◆ Impairs context encoding (hippocampus).
 - ◆ Does not impair encoding of sensations.
 - ◆ Resembles effect of fear/trauma.

- High dose/intoxication:
 - ◆ Impairs hippocampus-mediated encoding and consolidation of both context and sensations.
 - ◆ In a severe “black out,” nothing gets encoded.

Remembering the Experience

- The state of the brain when trying to remember affects what can be retrieved and put into words.
- If victims feel unsafe when questioned, they may not be able to use their prefrontal cortex to understand the questions and retrieve certain memories.
- If victims feel traumatized by questioning, this may trigger the bottom-up retrieval of fragmentary sensations and emotions that are nearly as intense as the assault itself.

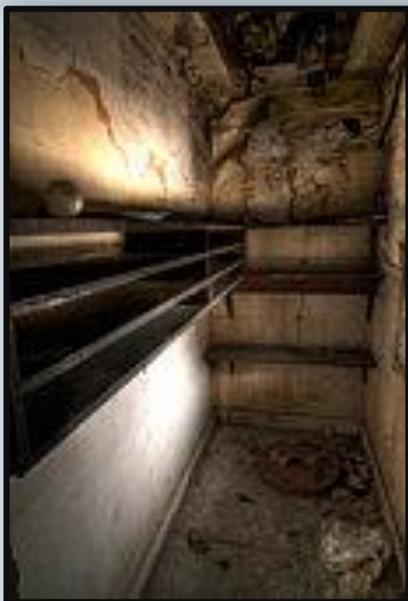
Remembering the Experience

- Remember: The survivor may have been dissociated at the time of the assault, and when they remember it later.
- Or the survivor can alternate between dissociated and emotionally upset remembrances: for example, from one meeting or investigative interview to the next.



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Life as a Minefield of Potential Trauma Triggers



Assault
Memory



A Better Understanding

“I’m going to help this victim feel safe, in control, competent, and cared for.”



Victim advocate provides better support for victim in court and during meetings with prosecutors.



Empathy for victim, empowerment of victim.



Victim advocate more easily determines victims’ physical and psychological needs.



Victim feels safer, is more cooperative, more able to remember, more willing to report.



Activity



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How Would You Respond? Worksheet 4.2

- Work in groups.
- Review the case studies and answer the questions.
- Report out to the large group.



Review of Learning Objectives

- Describe the basic components of the brain related to trauma.
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End of Module 4

Questions? Comments?



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