

## The Neurobiology of Trauma and Trauma Informed Care Dr. Christopher Wilson

### Why Neuroscience?

- It's no longer observational or "soft" science
  1. The science now includes studies of animal and human brains
  2. We are still making assumptions, but they are based in hard science!
- When listen to a victim describe his experience, not knowing the science can lead to doubting someone's account of what happened to him
- We have to caution against thinking we know what we'd do if we were in the same situation - this is a bias that leads to doubt and victim blaming
- When you have mistaken beliefs about human nature it leads to doubt and victim blaming as well

### Defining Trauma

- Extreme fear/terror/horror + lack of control/perceived lack of control
- These two conditions = very real changes in the brain at the time of the incident AND after the incident

### Circuits

- Our circuits are "baked in"
- We have attachment circuitry - based on parasympathetic nervous system
  - Designed to help us attach, be calm, rest/digest
- We have defense circuitry - based on sympathetic nervous system
  - Designed to help us deal with attack
- Our defense circuitry can be altered by a single occurrence of fear/trauma!

### Neural Networks

- The neurons that fire together wire together - these are about habits
- The more often/more intense = more robust neural networks
- A single trauma builds a ROBUST neural network that you can't just think or wish away based on logic

### Pre-frontal cortex (the thinking part of the brain) plays a role in:

- Top-down attention: you control what you pay attention to

- Integration of data: your memories are initially just related data points – the pre-frontal cortex integrates those data points into coherent accounts
- Logical decision making

Limbic System plays a role in:

- Threat network: your response to threat involves very little thinking
- Memory encoding: the data points have to be “labeled” in order to be integrated
- Emotion: it starts in the limbic system

Our Threat Network in Action:

- Constantly assess for safety (vigilance) using our maps of safety and maps of danger; and remember, not everyone perceives safety as you do
- Detect danger (amygdala)
- Assess the danger (using same maps of safety/danger thanks to hippocampus)
- React/respond to the danger reflexively/habitually
- Make rational, thought out decisions and integrate knowledge AFTER the threat has passed

If Event is Not Traumatic:

- You will most likely remember the details of what happened IN ORDER, and in quite a bit of detail

Threat/defense Circuitry Taking Over

When the threat/defense circuitry takes over there are FIVE consequences you have to understand. Three relate to our reaction to the threat, two relate to our memory.

Related to our reaction:

- 1: Impaired pre-frontal cortex
- 2: Survival reflexes/reactions
- 3: Self-protection habits

Related to our memory

- 1: Bottom-up attention
- 2: Altered memory encoding and consolidation

*1: Impaired Pre-Frontal Cortex*

- Stress challenges the pre-frontal cortex, but a stress reduction technique can help you quickly regain the function of that part of the brain.

- If you add threat or fear to the stress, your pre-frontal cortex is literally impaired, meaning you can just do a stress reduction technique and get it back. We are therefore left with only our reflexive reactions and habitual behavior when we react/respond to being sexually assaulted.
- We lose the ability to control our attention, integrate data, and make logical decisions. These first two have an impact on memory. The last on reactions.

## *2: Our survival reflexes*

### Freeze/Pause

- You've already learned about this response - it has three main functions:
  1. To camouflage the prey - predator can't kill/eat what it can't see
  2. To allow us to improve our ability to hear/see/smell
  3. To prepare us to suddenly burst into action

### Freeze – Flee – Fight:

- The notion of “fight or flight” is a bit misleading - it is more often a “cascade” and it's definitely not a choice.
- Our brains have evolved for us to flee when possible. As Dr. Jim Hopper says, “even fighting is in the service of fleeing.”
- So, it's freeze then flee

### Why do some folks not flee nor fight?

- As long as you don't ask this question out loud to a survivor (it will come across as victim blaming) it's a reasonable question from a scientific perspective.
- To make sense of it, understand that offenders (even situational offenders) are taking advantage of the fact that our attachment network inhibits our threat network. This is like spinning a web.
- This often leads to circuitry conflict, because grooming behavior triggers our attachment circuitry, which dampens our threat circuitry!
- So what happens if the person maps to safety but their behavior maps to threat? First off, the brain experiences circuitry confusion and often defaults to attachment (to preserve the relationship).
- But eventually this circuitry conflict leads to the awareness that the assault isn't stopping - pair this fear with circuitry conflict and most victims experience mental defeat. So, by the time the victim recognizes that he is being assaulted, the brain often engages in extreme flee responses (which are below)

### Dissociation:

- When folks dissociate, the interoceptive network (which about our awareness of our inner experience) is essentially disconnected.

- We are “spaced out” and sometimes folks report being in the upper corner of the room, watching the assault from afar.
- This is all in the service of survival and coping. It is an adaptive response.

#### Tonic Immobility

- Freezing = Alert and not moving, but **able** to move
- Tonic immobility = Paralysis, **can't move or speak** and you have “waxy flexibility”
- Caused by extreme fear, physical contact with perpetrator, restraint, perception of inescapability
- Can last from seconds to hours
- Does not impair alertness or memory encoding

#### Collapsed Immobility

- Is very similar to tonic immobility: You can't move or speak
- Same basic causes = extreme fear, physical contact with perpetrator, restraint, perceived inescapability
- Evolutionarily old response
- Sudden onset (but more gradual offset)
- Key differences from tonic immobility:
  - o Extreme decrease in heart rate and blood pressure
  - o Faintness, “sleepiness” or loss of consciousness
  - o Loss of muscle tone – Collapsed, limp, etc.

#### When does the brain get a fight response?

- You have to map the threat accurately - and then have prepared for how to handle the threat
- For example, a surfer can plan to punch a shark in the face
- But if a dolphin swims up, then what? We don't punch dolphins in the face, do we?
- Perpetrators, due to grooming, are sharks disguised as dolphins!

In addition to freeze/flee/fight we also have a reaction called tend and befriend or submit and negotiate:

- Tend to the offender's needs: this is based on the innate awareness that if the offender's needs are met, the offense will end sooner
- Befriend the offender: this is based on the innate awareness that we are less likely to be harmed if we build a relationship with the offender

#### Self Protection Habits:

- From childhood

- o Being a victim of abuse
- o Witnessing abuse
- From a relationship
- From just being raised as a kid

None of these habits are related to fighting back - they are all about submission, aren't they?

Furthermore, the Fear/Habit Paradox suggests that even when your brain accurately maps the threat, you will use habitual behavior that is consistent with the just prior attachment scenario!

Memory is a condition of focus:

- Whatever you focus on is what gets in encoded, consolidated, and stored.
- The details focused on by the victim are called central details. They get encoded and consolidated.
- The details not focused on by the victim are called peripheral details. They have a lower rate of getting encoded and consolidated.
- Remember weapon focus! And if there is no weapon, there is no way of knowing what a victim will remember.
- The victim may focus on the threat, but the victim may also completely ignore the threat.

The Hippocampus and Memory:

- The hippocampus has to do with memory. Remember the phrase, "if you saw a hippo on campus, you'd remember!"
- The hippocampus adds context to the data points that make up our memories. For our purposes, we will think of this as "date stamping".
- Remember, during a traumatic event the hippocampus goes through two phases: flashbulb and fragmented.

Sensory based Memory:

- Encoded with support from the amygdala
- The amygdala often encodes mainly with sensory data so cues for recall are going to be sensory based!
- Trigger or cue may have no apparent relationship to the crime scene or crime

Exposure to Trauma Equals:

- A hypersensitive amygdala that is trying to protect you but fires even when there is no threat present. This is because the amygdala is generalizing and trauma blocks differentiation (due, in large part, to cortisol).
- We are also then hyper-vigilant, which means very aware of the environment around us...which unfortunately feeds the hypersensitive amygdala.
- When the amygdala fires intensely we lose access to our maps of safety and threat. We can't just "realize we are safe" without some help.
- Survivors engage in avoidance behavior, high-risk behavior, and normalizing behavior. It's all about trying to deal with the cognitive dissonance of being a victim, dealing with an overactive amygdala, and trying to take back some sense of control.

#### The Left-prefrontal Cortex:

- Combines: subjective logic & language to create the story of your life...
- Dan Siegal from UCLA calls this the 3 L's: Logic, Language & LYING!
- The creation of meaning is a neurobiological reality and the Left pre-frontal cortex plays a huge role in the creation of meaning

#### Organizing:

- We all organize each other, all the time - it's simply how you let others know what you want.
- How are survivors organized when they disclosed? Do family and friends really want to hear about what happened, or hear what they want to hear?
- The brain will create meaning by filling in the blanks - often we will tell ourselves stories about what will happen when we disclose based on filling in blanks
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#### The Science of Mirror Neurons:

- When you see a behavior you've done before or are familiar with in some way, your mirror neurons fire more strongly (because they are motor neurons)
- When you see a facial expression, your mirror neurons send a signal down to your LIMBIC SYSTEM (because every facial expression is a function of muscle/motor activity and we are all familiar with every facial expression)
- Your Limbic System is involved in the experience of emotion and this is why it's so easy for us to make sense of facial expressions!

#### Organizing with Our Faces:

- Think about the facial expressions a one sees when one decides to disclose having been sexually assaulted
- Remember mirror neurons - we will have interpretations based on our own experience of those facial expressions...AND...
- Because of gestalt theory, we will fill in the blanks and interpret facial expressions with our own bias, integrate the victim blaming narratives of others, and potentially integrate how our body responded into our narrative and all with our own bias!

#### Implications for interacting with victims

- It's crucial to understand that the stress of interacting with law enforcement will likely impair the pre-frontal cortex – this makes it a challenge to integrate memory data into an account of “what happened.”
- If we take into account mirror neurons, it makes a very good case for making sure every interaction with a victim of trauma is done with “soft eyes” – a swing thought for reminding us to honor the experiences of those who've been traumatized. The opposite of “soft eyes” is “hard eyes” which we use often when we have a job to do, and are focused more on the job than the person.

So, to be trauma informed we have to:

- Get away from trying to figure out, and focus on understanding experience
- Use soft eyes all the time
- Be very intentional in how we create maps of safety (offer choice/model transparency)
- Never assume we know how a trauma survivor's brain will react
- Remember, most of a survivor's reactions are limbic!
- Be intentional, both personally and organizationally
- Get feedback, be open and flexible/focus on how to get over the hurdle, not the hurdle itself, & don't take it personally!