TRAUMA AND THE BRAIN

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AGENDA

- Defining Trauma
- Describing the Impact of Trauma
- Post-Traumatic Stress Disorder (PTSD)
- Fight vs. Flight and Brain Areas Affected
- Treatment Recommendations
- Resources and References
“The ordinary response to atrocities is to banish them from consciousness. Certain violations of the social compact are too terrible to utter aloud: this is the meaning of the word unspeakable. Atrocities, however, refuse to be buried.”

Judith Herman, M.D., Trauma and Recovery, 1992
According to the American Psychological Association (APA, 2015):

- “...an emotional response to a terrible event like an accident, rape or natural disaster. Immediately after the event, shock and denial are typical. Longer term reactions include unpredictable emotions, flashbacks, strained relationships and even physical symptoms like headaches or nausea.”
- Trauma often results in significant distress manifested as fear, hopelessness, or horror
- These events can have severe physical and psychological impact on individuals, families, and communities

Traumatic events can, “...strain the ordinary capacities of individuals and communities beyond the point that their resources can tolerate or absorb” (Wiger & Harowski, 2003, p. 11).
According to Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5):

- Exposure to actual or threatened death, serious injury, or sexual violence in one of the following ways:
  - 1 – Directly experiencing the traumatic event
  - 2 – Witnessing, in person, the event(s) as it occurred to others
  - 3 – Learning that the traumatic event(s) occurred to a close family member or close friend
  - 4 – Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders, police officers, etc.)
Single Incident vs. Multiple, Ongoing Trauma

- **Single Incident** – Also known as Type I Trauma, consists of one discrete instance (e.g., car accident)

- **Multiple, Ongoing** – Also known as Type II Trauma, consists of a number of events (e.g., sexual abuse as a child, bullying throughout school, intimate partner violence as a young adult)
Psychological distress following exposure to a traumatic or stressful event is quite variable:
- No to minimal psychological distress
- Anxiety and fear
- Sadness, loss of interest in enjoyable activities
- Anger, aggression, hostility
- Dissociation
- Use of maladaptive coping strategies (e.g., substance use)
- Some combination of symptoms and behavior
- PTSD, other psychiatric diagnoses (Mood, Anxiety, Behavioral)

Of note, depending on the type of trauma, a number of physical impairments may be present as well (e.g., physical injuries).
POST-TRAUMATIC STRESS DISORDER (PTSD)

(1) Intrusion Symptoms
- Distressing Memories
- Distressing Dreams
- Dissociative Reactions (Flashbacks)
- Intense Emotional/Physical Reactions to cues/reminders of the event

(2) Avoidance Symptoms
- Avoidance of memories, thoughts, and feelings associated with the trauma
- Avoidance of external reminders (e.g., people, places, situations, etc.) associated with the trauma

(3) Alteration in Mood / Thoughts
- Inability to remember details about trauma
- Negative beliefs about oneself / others / world
- Negative emotions (lack of happiness, satisfaction, etc.).
- Decrease in interests, activities
- Detachment from others

(4) Arousal Symptoms
- Increase startle response
- Hypervigilance
- Sleep disturbance
- Poor concentration
- Irritable, angry responses typically with little provocation
- Reckless, self-destructive behavior
90% of the population in the United States has been exposed to a traumatic stressor (Corales, 2005)

Only about 8-9% of the population develop PTSD (APA, 2013)

- Sub-threshold reactions not accounted for nor are other diagnoses (e.g., Adjustment Disorder, Depressive Disorder)

Trauma is subjective – one person’s experience of an event can be completely different from another person’s experience.
Women are more likely than men to develop PTSD; approximately 10% of women develop PTSD compared to 5% of men (United States Department of Veterans Affairs, 2012).

The average age of onset for PTSD is estimated around 23 years, however, individuals between the age of 45-59 have the highest prevalence rate among all age groups (National Institute of Mental Health, 2005).

Occupational Hazards – Higher prevalence rates among first responders, military personnel, and those exposed to disasters.
The economic burden of PTSD was estimated at $42.3 billion (Sidran Institute, 2015)

- Psychiatric and non-psychiatric treatment costs
  - More than half of the above-estimate is attributed to repeat use of healthcare services to relieve anxiety-related symptoms
  - Individuals with PTSD have among the highest rates of healthcare service use in the US

- Indirect workplace costs

- Mortality costs

- Prescription drug costs
Coping style is a significant predictor that greatly influences risk for PTSD.

- Avoidance (cognitive and behavioral)
- Impaired coping (e.g., use of substances)
- Recovery environment is harsh and/or rejecting
- Length of time before intervention
1: Exposure
Exposure to traumatic stressor(s)

2: Response
Exposure results in a physical, emotional, and psychological response: “Fight vs. Flight”, extreme hyperarosal, associated with unpleasant emotions, cognitions, sensations, etc.

Can result in changes to brain structures/chemicals:
- Hippocampus (memory)
- Amygdala (emotion)
- Prefrontal cortex (learning, decision making)

3: Aftermath
After the event, changes to brain structure/chemicals can remain, as well as the emotions, cognitions, sensations associated with the event.

Processing the event can help resolve these effects, but re-exposure is linked with very unpleasant sensations/hyperarosal.

Thus, avoidance occurs

4: Avoidance
Avoidance maintains PTSD symptoms. The individual remains in a state of avoidance (unable to manage memories, feelings, cognitions associated with the event) due to concerns about hyperarosal.

5. The Curse is the Cure
Re-exposure to distressing memories, emotions, hyperaroused state while utilizing skills to manage the distress is the primary mechanism for psychotherapy aimed at treating PTSD.
## FIGHT VS. FLIGHT

### Chemical Response
- Release of adrenocorticotropic hormone
- Increased adrenaline
- Increased glucose
- Increased cortisol

### Result
- Increased heart rate
- Increased blood pressure
- Dilated pupils, tunnel vision
- Flushed face, dry mouth, shaking
- Storage of fuel, decreased digestion
- Muscle tension

This response is “re-activated” in individuals with PTSD when reminded of the threat or even when the threat is not present; this can result in an “etched” pattern in the brain.
The Neural Circuit of Stress

**Hippocampus = Memory**
- Usual Function = Formation and retrieval of memories
- PTSD = lower hippocampal volume (size), loss of ability to distinguish between past memories and present experiences, loss of ability to interpret environmental contexts appropriately

**Amygdala = Emotion**
- Usual Function = “First responder” in terms of emotional content, triggers the fight or flight response, linked to fear responses
- PTSD = over-activity of the amygdala, perceiving a threat or danger when there is none present

**Prefrontal Cortex = Logic and reasoning**
- Usual Function = Decision making, planning, and mediating emotional content
- PTSD = Underactivity in this area, resulting in a less effective mediating function, unable to mediate fear effectively

The structure and function of these areas of the brain are impacted in individuals with PTSD; thus, they continue to perceive and respond to stress differently from someone who is not affected.
A number of studies have confirmed:
- The neural circuit of stress
- Changes to the brain areas identified
- Neurochemicals involved
- Fight or flight response
- Effective treatments for children, adolescents, and adults who have been exposed to a variety of traumatic stressors

Emerging research around:
- Other areas affected
- Neurotransmitters affected
- Impact of treatment/therapy on brain areas
- Prevention / Early intervention strategies

The brain is resilient and flexible, change is possible
Understanding and compassion

- In many cases, the wounds of trauma are not visible, but it does not mean they are not present

Support

- Remember the mediating factors post-trauma!

Education

- PTSD, along with many other mental health conditions, can be misunderstood or symptoms can be “mis-categorized”
Psychotherapy ("Talk Therapy", "Counseling", "Therapy")
- Exposure-based therapies are common and evidence-based
- Most focus on teaching skills to manage distressing symptoms and then developing a detailed account of the event(s) while describing thoughts and feelings

Medication
- To manage anxiety-based symptoms, mood, etc.

Combination Treatment
- The most effective treatment is a combination of medication and psychotherapy
RESOURCES

- American Psychological Association
- National Alliance on Mental Illness (NAMI)
  http://www.nami.org
- National Child Traumatic Stress Network
  http://www.nctsn.org/
- National Institute of Mental Health
  http://www.nimh.nih.gov
- Trauma-Focused CBT Online Training
  http://tfcbt.musc.edu
- US Department of Veterans Affairs – National Center for PTSD
  http://www ptsd.va.gov/
REFERENCES