The Neuroscience of Trauma and Participant Engagement in Treatment Courts

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What's Ahead

1. The neurobiology of engagement
2. Impact of trauma on the deeply social brain
3. Social pain and substance use disorder
4. Relationship regulating strategies for increasing engagement

Trauma Defined

Individual trauma results from an **event**, series of events, or set of circumstances that is **experienced** by an individual as physically or emotionally harmful or threatening and that has lasting adverse **effects** on the individual's functioning and physical, social, emotional, or spiritual well-being.

SAMHSA 2013

Types of Trauma

- Developmental
- Acute
- Repetitive or Chronic
- Complex
- Historical
- Vicarious

Trauma is Pervasive in Justice-Involved Populations

Women

96% lifetime trauma experiences
74% current trauma experiences

Men

89% lifetime trauma experiences
86% current trauma experiences

Targeted Capacity Expansion Jail Diversion Study (**http://gainscenter.samhsa.gov**)

Non-conscious

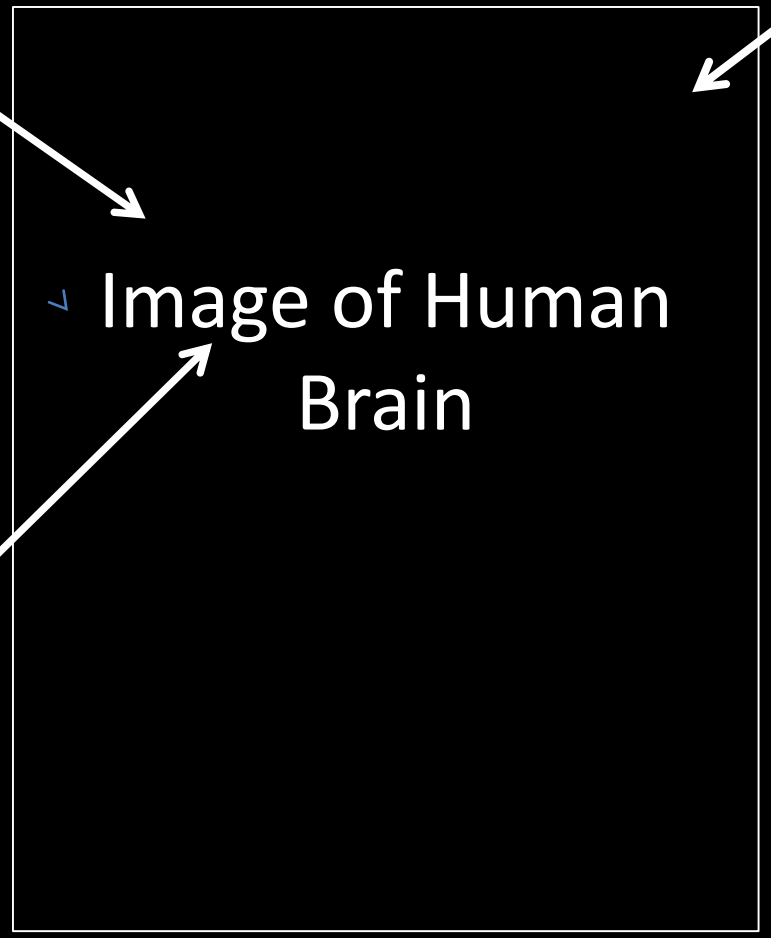
Basal Ganglia

- ***Fast***
- ***Automatic***
- ***Hardwired habits***
- ***Large volume***

Conscious

Prefrontal Cortex

- ***Slow***
- ***Decision Making***
- ***Thinking***
- ***Self-regulation***
- ***Small volume***



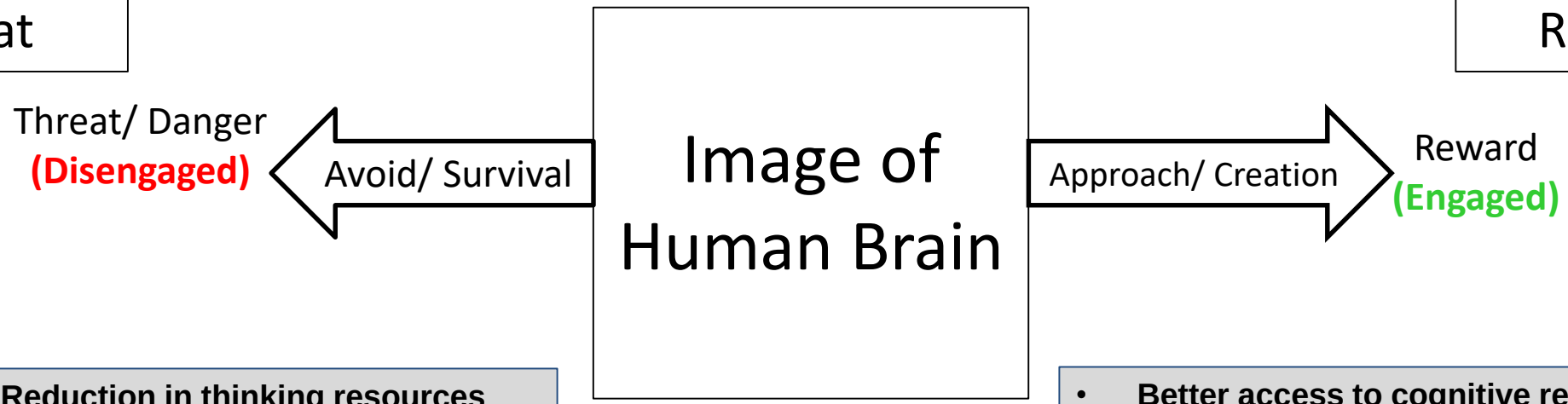
Limbic System

- ***Emotion***
- ***Memory***
- **Motivation**

Minimize Danger, Maximize Reward

Image of Threat

Image of Reward



- **Reduction in thinking resources**
- **Decrease in Prefrontal Cortex capacity**
- **Reduction in creativity**
- **More negative thinking**
- **Constricted field of view**
- **Decrease in ability to collaborate**
- **Increase in mistakes**
- **Generalize to other areas**
- **Increase in cortisol (stress hormone)**

Strong predisposition to threat!

- **Better access to cognitive resources (Amy Arnsten)**
- **Increase in creative ideas (Barbara Frederickson)**
- **More Insights (Mark Jung-Beeman)**
- **Able to see and take in more information (Schmitz, De Rosa, & Anderson)**
- **Decrease in mistakes**
- **More collaborative**
- **Increase in dopamine levels**

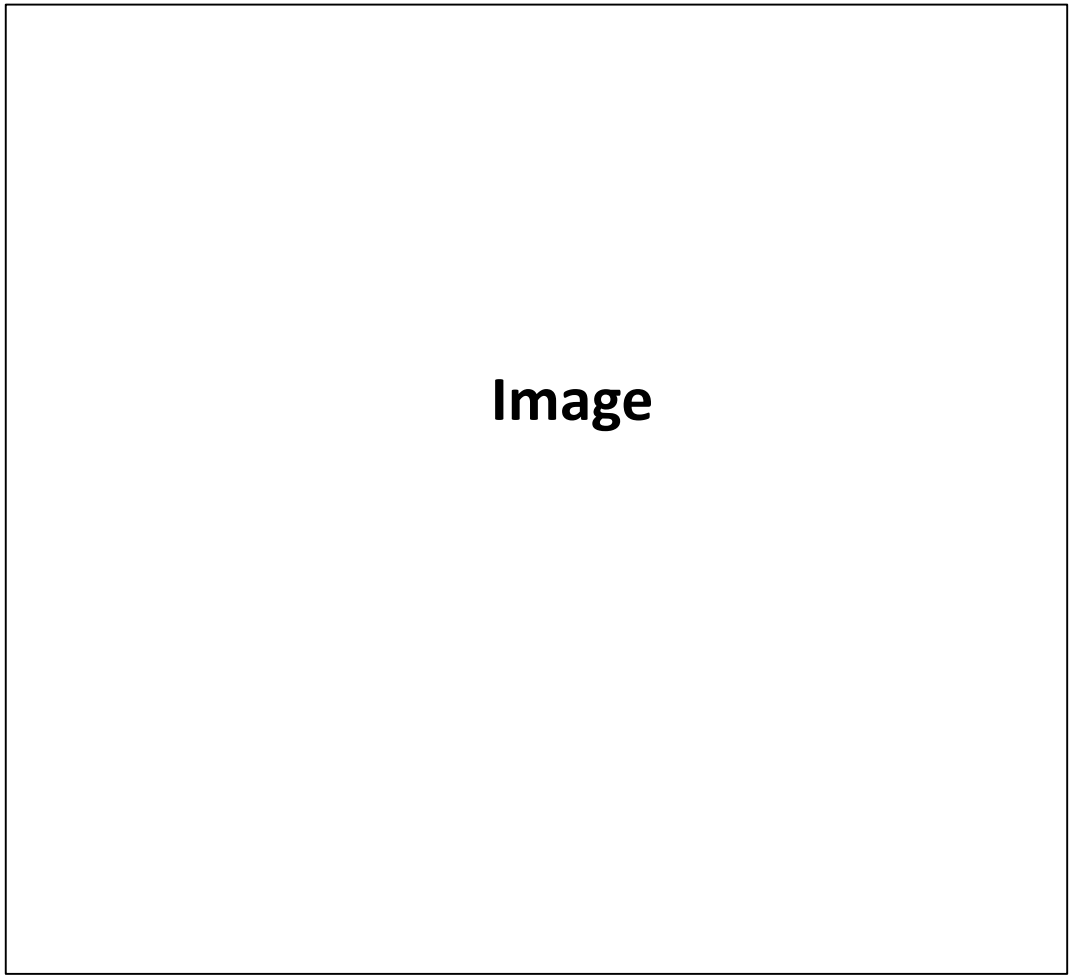
Gordon, E., 2000, 2013

Social Needs = *Survival*

Our response to the need for food, water, air and safety from physical harm is the same as our response to how we feel people treat us.

Background Image Depicting Predation in the Animal Kingdom

The Deeply Social Brain



- **Human brain is the social organ**
- **Social pain = physical pain**
- **Social pain activates threat state (disengagement)**
- Need for social connection
- Brain’s solution to ensure nurturance/attachment
- Think about ourselves and others

Eisenberger, N & Lieberman, M., 2004

• Physical Pain & Social Pain

- Social pain can be defined as – “a specific emotional reaction to the perception that one is being excluded from desired relationships or being devalued by desired relationship partners or groups”.
  - From an interpersonal model of addiction relapse (quote from Leach & Kranzler, 2013).

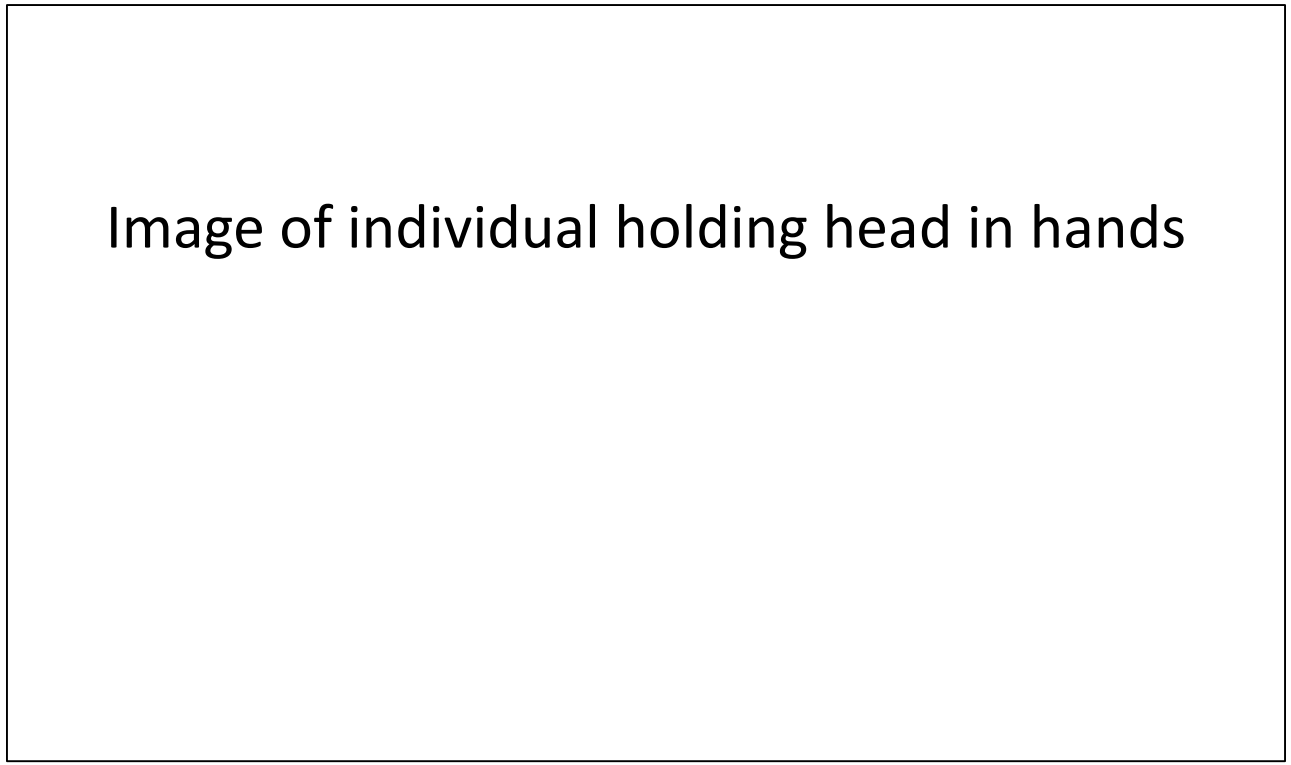
- Even “anticipation of secure interactions involves the reward circuitry”, which acts to release neurotransmitters
  - (Carr, 2008a, cited in Hass-Cohen, 2015, p. 88)

Embedded Video illustrating experimental evidence for the neurological equivalence of physical pain and social rejection.

Image of cigarette packs

Social disconnectedness is bad for your health

This may be why loneliness is as bad for your health as smoking two packs of cigarettes a day.



Trauma= overactivation of the stress neurobiology

Neglect - poverty of experience

Image of bare tree in shape of human head

Brain development

Three images of trees at different stages of growth with “root balls” depicted as developing human brains with increasing size and complexity of neuronal networks

- Attachment/bonding/communication
- Neurons will move to areas of the brain and form connections- neuronal networks- based on the caregiver-child relationship
- Attachment templates and neural maps are created that provide ideas about human beings

Addiction Defined

Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Dysfunction in these circuits leads to characteristic biological, psychological, social and spiritual manifestations. This is reflected in an individual pathologically pursuing reward and/or relief by substance use and other behaviors.

– Newsletter of the American Society of Addiction Medicine, Vol. 26, Number 3, 2011.

Addiction and Brain Change

Like exposure to trauma, repeated drug use causes long-term changes in the way the brain processes information and emotions (NIDA)

REWARD SYSTEM VULNERABILITY & IMPULSIVITY

- Addiction vulnerability – genetics is only part of the story; experiences and the environment also contribute to individual risk.
- Brain-based changes in **reward sensitivity** (greater urge for drug's rewarding effects); and **impulsivity** (less behavioral control over the experienced urge) (p. 118-119).
- The **striatum** is a key brain area associated with dopamine dysregulation and affects motivation, reward and goal-directed behavior
- Striatal activity and dopamine release are associated with both reward interpretation and impulsive behavior.
  - (Egervari, Ciccocioop, Jentsch, & Hurd, 2018)

STRESS & REWARD SYSTEM DYSREGULATION

We've learned that….

- Addiction is a **stress** and **reward system** disorder.
- Pain activates a stress system response which can lead to negative affect and subsequent drug use.
- Chronic pain also linked with depression and anxiety. (p. 804).
  - (LeBlanc, McGinn, Itoga, & Edwards, 2015)
- Function of the opioid system is to control pain.
- Specifically, opioids act indirectly to increase dopamine release in VTA-Nucleus accumbens pathway by inhibiting the neurons that would decrease dopamine release
  - (Hill et al., 2017, p. 146).

STRESS & REWARD SYSTEM DYSREGULATION (Continued)

- Drugs magnify the reward effect and increase drug-seeking behavior
- These changes lead to impaired decision-making.
- For example, deficits in prefrontal cortical functioning can contribute to aggressive and antisocial behavior that can lead to criminal activity.
- Studies have shown that the combination of a dysregulated amygdala and an underperforming prefrontal cortex, specifically the ventromedial PFC, contribute to the risk of criminal behavior.
- The challenge in recovery is to recalibrate the reward circuitry's threshold that has been neurochemically altered by drugs of abuse, so that natural rewards will hold value again.
  - Jorgensen, C., Anderson, N. E., & Barnes, J. C. (2016). Bad brains: Crime and drug abuse from a neurocriminological perspective. *American Journal of Criminal Justice, 41*, 47-69.

ASSOCIATIONS BETWEEN SOCIAL AND PHYSICAL PAIN; SOCIAL AND CHEMICAL REWARDS

- Physical pain and social pain both involve activation of the ACC (anterior cingulate cortex) – increased activity in ACC is correlated with increased subjective negative affective experience of physical and social pain (Leah & Kranzler, 2013).
- In rat studies, increased “distress vocalizations” that result from rat pup separation from the mother correspond with a decrease in endogenous opioids similar to opioid withdrawal…..”administering morphine simulates the presence of the mother” (Leah & Kranzler, 2013, p. 184).
- Social exclusion is associated with increased cortisol levels, fight/flight response, as the body responds as if there’s a physical threat.
- Social inclusion/social support associated with a more regulated HPA system. Greater daily support associated with decreased ACC activation and reduced cortisol response.
- Secure early life attachment promotes ability to regulate emotions and stress reaction
  - Above from: Leah & Kranzler, 2013

STRESS, PAIN, OPIOID USE

- Stress and negative affect contribute to craving and relapse.
- Pain increases negative affect, through action on the brain's stress and reward circuitry, and can exacerbate vulnerability to addiction.
- Pain sensitivity may lead to opioid misuse. "Opioid cue-induced craving was indeed predicted by individual pain sensitivity. Moreover, this sensitivity was based not on pain perception but on pain-induced distress, suggesting the critical role of the negative emotional translation of pain in relapse compared to the sensory dimension…" (LeBlanc et al, 2015, p. 806).
- Opioid use itself may create a CRF (corticotropin releasing factor) sensitization that increase pain sensitivity and reinforces continued opioid use (Ewan & Martin, 2011).
- Specifically, CRF in amygdala regions may lead to pain-induced negative affect which can increase the craving response and lead to relapse.
- Sensitivity-negative affect-craving-relapse cycle. Opioid use increases sensitivity and starts the cycle again

“The evolution of these brain systems is critical to survival, but the system is vulnerable to drugs of addiction that mimic natural opioids and provide stronger relief of both physical and emotional pain than endogenous opioid activity”

– (Hill et al., 2017, p. 142).

Summary Points

- Affective dimension of physical pain and social pain (e.g., social rejection) both involve the opioid system.

- When the brain's natural chemical environment is not getting what it needs from its environment (e.g, experiences, relationships) to function properly, it may find chemical adaptation from external sources (e.g., drug-seeking and consumption behavior), further distorting the brain's endogenous opioid system from functioning on its own.

- Continuing to use opiates may reduce social pain, as well as physical pain, and therefore **social interventions** are needed just as much as MAT pharmacological or other individual-focused behavioral interventions.

STRATEGIES FOR BEHAVIOR CHANGE IN COLLABORATIVE COURT PARTICIPANTS WITH SUD AND A HISTORY OF EXPOSURE TO TRAUMA

- Pain-induced distress leads to craving; what about social pain-induced stress also triggering craving and relapse? Heilig et al (2016) in Hill et al(2017): “Improving the social integration of drug users through opportunities for housing, jobs and meaningful relationships is therefore not merely a nonspecific intervention but rather a neurobiologically specific and critically important way to decrease drug use “ (p. 4) (p. 164).

- Now think about **social pain** as: racism, family conflict, disengagement from the labor market, social exclusion, etc. as risk factors….

The human resistance to change is really the human resistance to pain.

“Fear destroys the capacity to learn.”

- Bruce Perry

Image of man walking away, over cracked earth.

Adult Drug Court Best Practice Standard VI: A Framework for Responding to Trauma

VI. Complementary Treatment and Social Services

– Participants receive complementary treatment and social services for conditions that co-occur with substance use disorder and are likely to *interfere with their compliance* in Drug Court, increase criminal recidivism, or *diminish treatment gains*.

Three Responses to Trauma:

- Team Training
- Screening and Assessment
- Self-regulation Strategies

The Mindset

- It is safe to assume that a very high proportion of high-risk, high-need defendants, parents, and former offenders have histories of exposure to trauma
- Do not presume that court or treatment settings are perceived as safe places.
  - Establishing safety is step one.
- Symptoms are likely to be adaptive reactions to traumatic experiences (normal responses to abnormal conditions)
  - Fear activation promotes survival in the street and must be distinguished from resistance to change and noncompliance.

Strategies

- Your own state of calmness and composure is required to engage participants affected by exposure to trauma
- In the moment self-regulation tools to control physiological reactions to environmental triggers and implicit “trauma reminders”
- Mindfulness, meditation tools