

Understanding Neurobiology of Psychological Trauma



Tips for Working with Transition-age Youth

November 2017

Following rapid structural, functional, and neurochemical changes in the brain during early- to mid-adolescence, the pace of *neurodevelopment* during late adolescence through the 20s is slower and more focused.¹ Changes are concentrated on strengthening neural connections that advance emotional regulation, risk-reward assessment, problem solving, and future planning. Communication between emotional and thinking centers becomes more efficient, providing a greater capacity to think before acting, and consider multiple solutions in emotionally-charged situations.

This period of development also brings a higher probability of the emergence of *mental health disorders*,² and the intensifying of childhood emotional and behavioral concerns.³ Neuroscientists are working to understand what happens in the brain that increases this vulnerability to mental health challenges. Genetics, social context, and childhood adversity all appear to be significant influencers.⁴

Chronic stress during childhood, also referred to as *early life adversity*, has been linked to physical

and mental health difficulties during emerging and later adulthood.⁵ Notably, brain areas most involved in responding to traumatic/adverse experiences throughout the lifespan are also the ones that undergo significant developmentally-based changes during adolescence and through the 20s. Given the high prevalence of trauma exposure among transition-age youth,⁶ additional research about this unique neurobiological intersection is needed to better inform interventions.

Trauma's Neurobiological Signature

The word trauma is often used in conversation to describe a range of stressful everyday experiences. Yet not all stress changes a person's neurobiology or the ability to feel emotionally safe. *Psychological trauma*, a form of chronic traumatic stress, is felt emotionally and physically, and affects brain circuitry, including altering the stress response system.

What is experienced as traumatic psychologically differs across individuals. Psychological trauma includes the individual's subjective perception of what is traumatic. Key factors that influence this variation include prior trauma, developmental stage, severity of the trauma exposure, and the involvement of interpersonal relationships. For example, adolescents are especially sensitive to social stressors from peer influences, compared with children and adults.⁷ Additionally, knowledge about historical trauma such as the effects of African Americans' experience of slavery and epigenetic transmission informs understanding of individuals' vulnerability to psychological trauma.^{8,9} Recognizing the neurobiological underpinnings of psychological trauma is essential to service providers' application of trauma-informed care skills.

Neuroplasticity & Adaptive Coping Strategies

Neuroplasticity refers to the brain's remarkable adaptability. *Adaptive survival-based coping strategies* that emerge in response to adversity are rooted in the biological imperative to survive life-threatening situations and cope with the aftermath of trauma. Often formed during childhood, these adaptations are embedded in neural networks, functioning outside of conscious

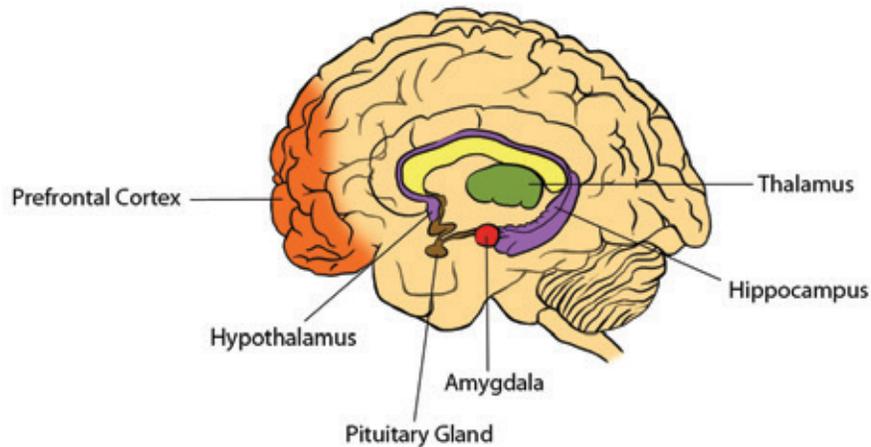
awareness and operating even after the trauma exposure has ended. The brain stores trauma memories as part of a protection strategy. When memories quickly (and sometimes frequently) intrude into the present as upsetting thoughts, emotions, sensory memories, bodily sensations, or flashbacks, the original sense of fear, as well as the associated self-protective, survival strategies are activated. *Adaptive behaviors* such as aggression, spacing-out, avoidance, and distrust become automatic responses to the slightest cue of danger. For example, trauma survivors' sensitivity to loud noises, odors, physical proximity to others, and touch can instantaneously activate adaptive reactions.

Neuroplasticity is key to healing and recovering from psychological trauma. *The mind and body can learn to feel safe again*. Updated adaptive strategies develop when the threat is not imminent and safe relationships are available. When service providers see traumatic stress responses as neurobiologically-embedded coping adaptations rather than as symptoms of mental health disorders, or intentional disruptive behaviors, they can help individuals to revise these coping strategies to better meet their current needs.

Threat Assessment System for Survival

The stress-response system called the *hypothalamus-pituitary-adrenal (HPA) axis* is initiated by actual or perceived threat. The *amygdala*, as the first responder, receives information from the *thalamus*, (gatekeeper of incoming sensory information) which is rapidly screened for danger, with the potential of activating the pituitary (gland that releases hormones). The

Figure 1. The Brain



(Illustration by Halorie Walker-Sloss)

hippocampal memory system assists in this assessment by providing the amygdala with information from its database of past threats. In tandem with the *prefrontal cortex (PFC)*, (critical for emotional regulation and decision-making), the hippocampi (memory storage structures) are also essential in deactivating the HPA axis when threat subsides.

Once the amygdala sounds the alarm, the HPA axis releases a cascade of chemicals and hormones, *mobilizing* the individual to survive the threat by fighting or fleeing. When mobilizing is not possible, then survival through *immobilizing* kicks on, significantly slowing the individual's life sustaining systems (e.g. heart rate, breathing). These reactions are immediate, bypassing any thoughtful decision-making. Typically, when the real or perceived danger passes, the HPA axis returns to its pre-threat status.

However, when trauma is ongoing, such as chronic abuse or neglect in childhood, the HPA axis continues to flood the body with the

stress hormone *cortisol* from the adrenal glands (producer of several key hormones). This over-production creates a state of *toxic stress* within the body that changes the physical structure and function of the amygdalae, hippocampi and PFC. Although the brain's intention is to promote a higher possibility of survival through a state of constant vigilance, other capacities are compromised, such as thinking clearly and managing feelings. The high levels of cortisol, and inability to emotionally regulate heighten the probability of the youth engaging in risky behaviors and of the onset of physical health issues.¹⁰

Youth who have experienced childhood adversity, or have current toxic stress, are often stuck in *fight or flight mode*, feeling jumpy, anxious, or hyper-vigilant; some can be stuck in *shutdown*, feeling disconnected, foggy, numb, or unfocused. These feelings, the behaviors that coincide, and the reactions of others are confusing and disrupt functioning in daily activities and relationships.



TIPS

- Share about the brain's natural abilities to adapt and promote survival during traumatic experiences.
- Support youth in sharing about their current coping behaviors, and assigning new meaning through a survival promotion lens.
- Help co-construct modifications in existing coping strategies and brainstorm new strategies, especially ones that include healthy relationships.
- Increase your awareness of the early signs of mobilization responses (fight & flight) and immobilization responses (shut-down) in youth. Observe and co-regulate.
- Talk with youth about the stress response system; guiding them in noticing emotional and physical sensations during activation.
- Learn to recognize implicit sensory activation cues that youth may encounter (e.g. sounds/noises, smells/scents, touch/proximity, time of day/year, celebrations). Minimize exposure when possible. Stay compassionate and curious when activation occurs.

Co-regulation & Strengthening Resilience Capacity

Relational Safety is Key

People are neurobiologically hardwired to be emotionally connected with others. When this biological imperative to feel secure in early attachments is disrupted through traumatic experiences, relationships are likely to generate a sense of fear, or anxiety, rather than a sense of safety and comfort. Youth receiving services have often experienced their earliest relationships with caregivers as unpredictable and unsafe.¹¹

Communication that facilitates the attachment process during infancy is primarily through non-verbal, sensory-based signals, such as sounds, touches, smells, tastes, and eye contact.

How the caregiver attunes to and co-regulates the baby's emotional and physiological states teaches the infant how to trust and participate in relationships. Whether these early relational experiences are comforting or frightening to the infant, a neurobiological imprint is made, a guidebook of sorts, for navigating relationships.

Pre-verbal memories are stored and remembered quite differently compared with memories from toddlerhood and beyond. Earliest memories are held in the amygdala's *implicit memory system* and are "recorded" without narrative, or a sense of self, time, or place. These memories are sensory-based, such

as smells, temperatures, touches, tastes, and sounds, often associated with the caregivers. At approximately 2 years of age, the hippocampal *explicit memory system* comes online and begins recording autobiographically. Recall of explicit memories typically begins around the age of 5 years and includes images and narratives with a sense of self, time, and place.

It is the implicit memory system that is also the record keeper of psychological trauma

throughout the lifespan. Like early memories, trauma memories are recorded from a sensory perspective. These memories can be hidden from awareness, demonstrating the brain's way of protecting the individual from painful memories. However, fear can still be activated when a sensory cue becomes present. Without explicit memory access, we feel overwhelmed and react without knowing why.



TIPS

- Go slowly in your relational engagement. Remember this is not a linear process.
- Celebrate small achievements.
- Take a stance of “not knowing.” Youth are the experts on their lives. They have wisdom to share.
- Practice wondering and asking: “What’s happened to you?” rather than, “What’s wrong with you?”
- Listen more. Ask fewer questions.
- Co-regulate through empathy and attuning verbally and non-verbally.
- Limit “Why?” questions.
- Use open-ended questions that invite curiosity and self-reflection, rather than require answers.
- Notice when emotions quickly shift, which often indicates that implicit trauma memories have been activated.
- Stay in the present moment and respond with compassion and acceptance.
- Resist the urge to give interpretations; instead offer insights, and facilitate exploration of possible outcomes in specific situations.
- When you make a mistake—acknowledge, apologize, and rewind, modeling expression of vulnerability, courage, and honesty.

Vicarious Traumatization & Wellness Practices

Providing services to youth affected by psychological trauma is rewarding and challenging. While bearing witness to a youth's suffering is central to this work, there is a personal cost to caring that is unavoidable. This cost has different names: compassion fatigue, vicarious traumatization, and secondary traumatic stress.¹² Like direct exposure to trauma, providers' indirect exposure to trauma impacts their neurobiology, with the effects emerging cumulatively over time.

As a service provider, your greatest resource is your ability to engage youth in a connected, trustworthy relationship. Your self-awareness, authenticity, and a well-regulated neurobiology are foundational to the youth's experience of relational trust and a felt sense of safety. Recognizing the indicators of vicarious trauma and staying healthy are essential to being trauma-informed.

Examples of possible effects of vicarious traumatization:

- **Physical:** Fatigue, physical symptoms (e.g. headaches), frequent illness
- **Emotional:** Irritability, resentment, hopelessness, feeling unsafe
- **Cognitive:** Intrusive thoughts, images, doubting competency
- **Behavioral:** Avoidance, unhealthy coping, isolating
- **Relational:** Emotional spill-over, being argumentative, joyless, distracted.

Use these examples to regularly conduct a self-inventory. Develop a rating scale and track changes in effects. Write down personal and professional wellness and self-care strategies.



TIPS

- As you witness suffering and realize its effects on you, also recognize the positive effects of witnessing resilience.
- Share your experience of vicarious trauma with colleagues. Break the silence and aloneness that often accompanies experiences of trauma work.
- Keep your list of wellness and self-care practices visible at your workplace and home. Practice at least 1 or 2 daily.
- If you supervise peer support providers, encourage them to proactively make self-care plans.



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RESOURCES

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Suggested Citation

Rosenzweig, J. M., Jivanjee, P., Brennan, E. M., Grover, L., & Abshire, A. (2017). *Understanding neurobiology of psychological trauma: Tips for working with transition-age youth*. Portland, OR: Research and Training Center for Pathways to Positive Futures, Portland State University.



Tipsheet produced by Pathways Transition Training Partnership, Research and Training Center for Pathways to Positive Futures, Portland State University, Portland, OR.

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The contents of this tipsheet were developed under a grant with funding from the National Institute of Disability, Independent Living, and Rehabilitation Research, and from the Center for Mental Health Services Substance Abuse and Mental Health Services Administration, United States Department of Health and Human Services (NIDILRR grant 90RT5030). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this tipsheet do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.