

Pediatric PTSD: Diagnosis, Treatment, and Neurobiology

Brain and Behavior Research Foundation: Meet the Scientist

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Objectives



Know the epidemiology and consequences of trauma and PTSD in youth



Understand treatment modalities used for pediatric PTSD and comorbid illnesses



Review what is known about the neurobiology of pediatric PTSD



The history of pediatric PTSD



REVIEW AND OVERVIEW

The American Journal of
Psychiatry

Through a Developmental Lens: Emerging Insights to Understand and Treat Pediatric PTSD

Justin D. Russell, Ph.D., Sara A. Heyn, J.D., Ph.D., Ryan J. Herringa, M.D., Ph.D.



Am J Psychiatry 180:9, September 2023

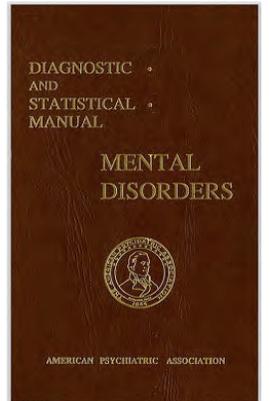
Children were thought to be resilient to trauma

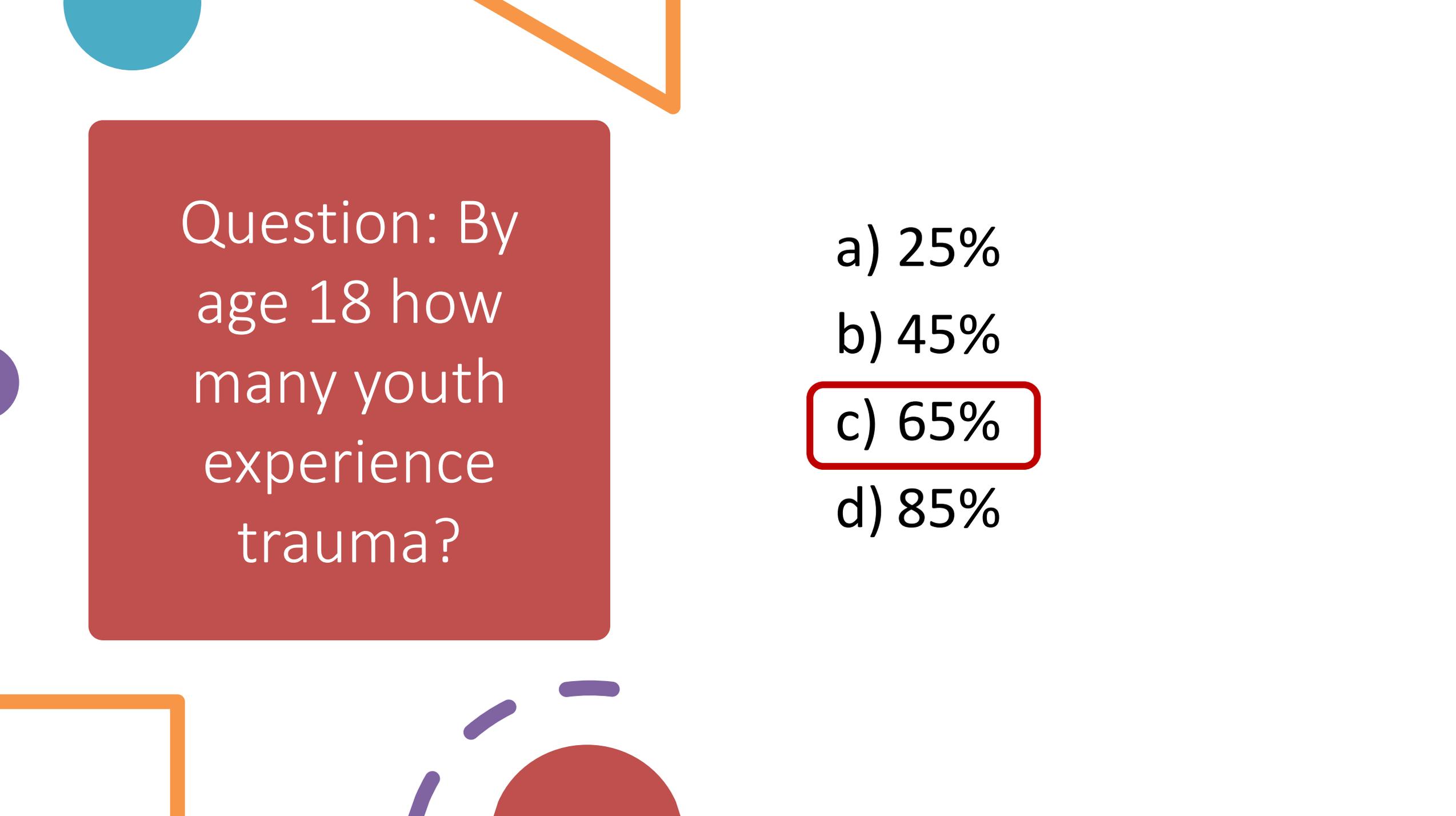
1976 Chowchilla bus kidnapping – 26 children and the bus driver



Evolution of the PTSD diagnosis

- Historically most research has been based on adults
- DSM-I (1952) – Gross stress reaction
- DSM-II (1968) – Transient situational disturbances
- DSM-III (1980) – PTSD, diagnosable in children and adults
- DSM-III-R (1987) – recognition of differences in pediatric PTSD symptoms (repetitive play, developmental regression)
- DSM-IV (1994) – required reaction to trauma, including disorganized or agitated behavior in children
- DSM-5/TR (2013) – separate diagnostic criteria for children under 7





Question: By
age 18 how
many youth
experience
trauma?

a) 25%

b) 45%

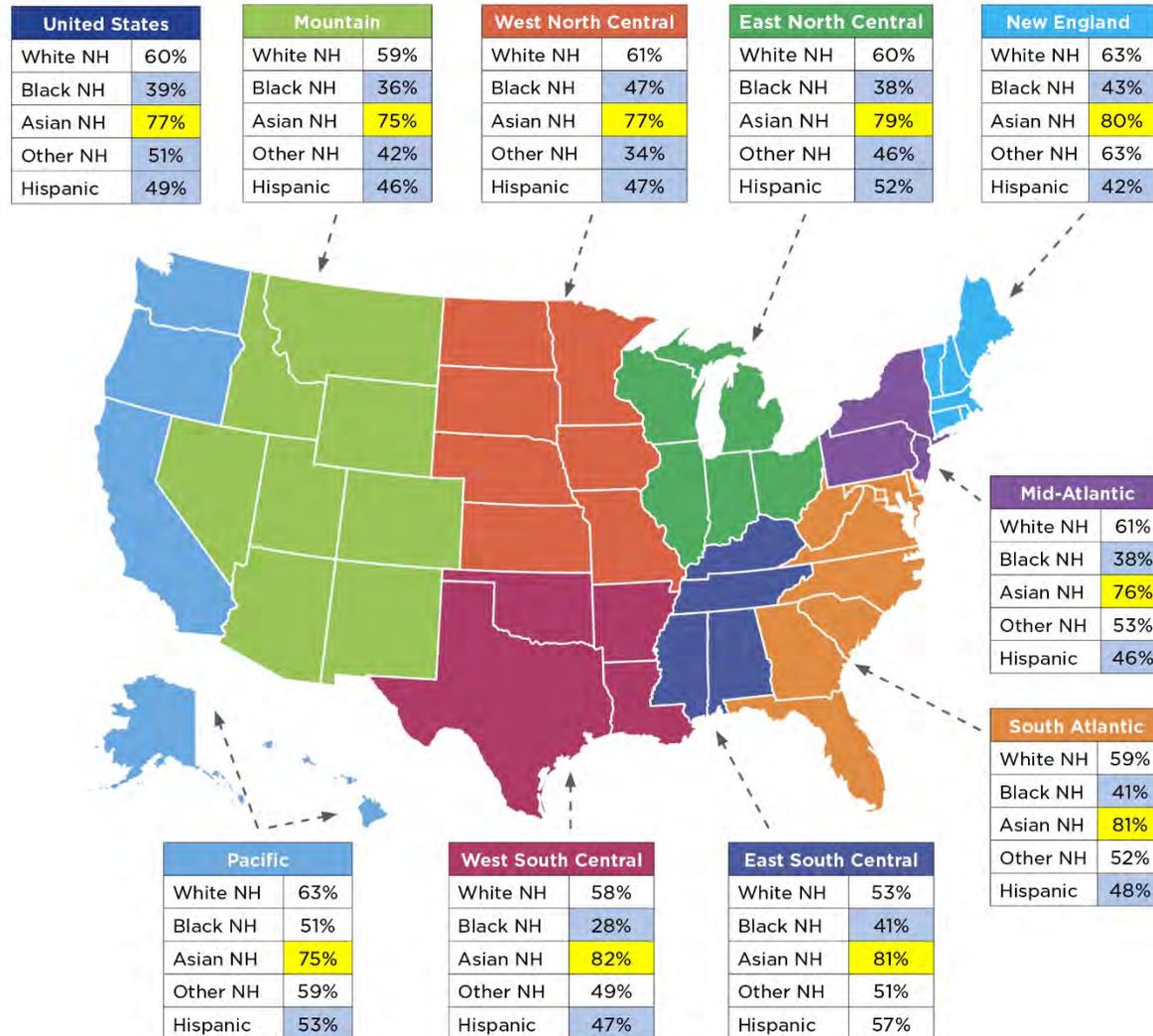
c) 65%

d) 85%

Trauma Statistics

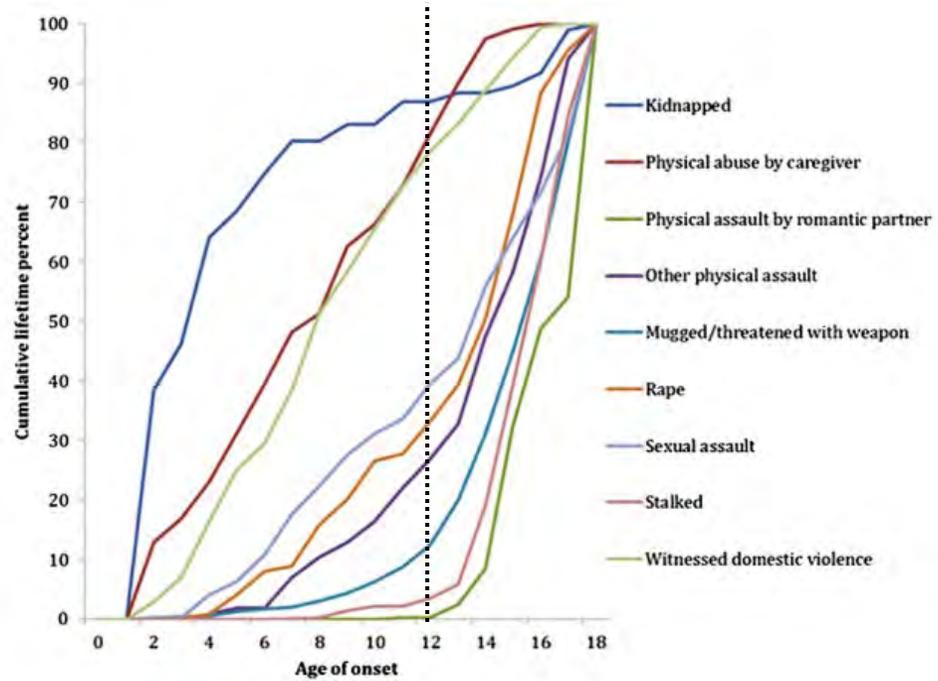
- 2 in 3 youth experience a potentially traumatic event by age 18
- Estimated lifetime prevalence of child abuse
 - Physical abuse: 28%
 - Sexual abuse: 21%

Not evenly distributed: Black and Hispanic youth have more trauma

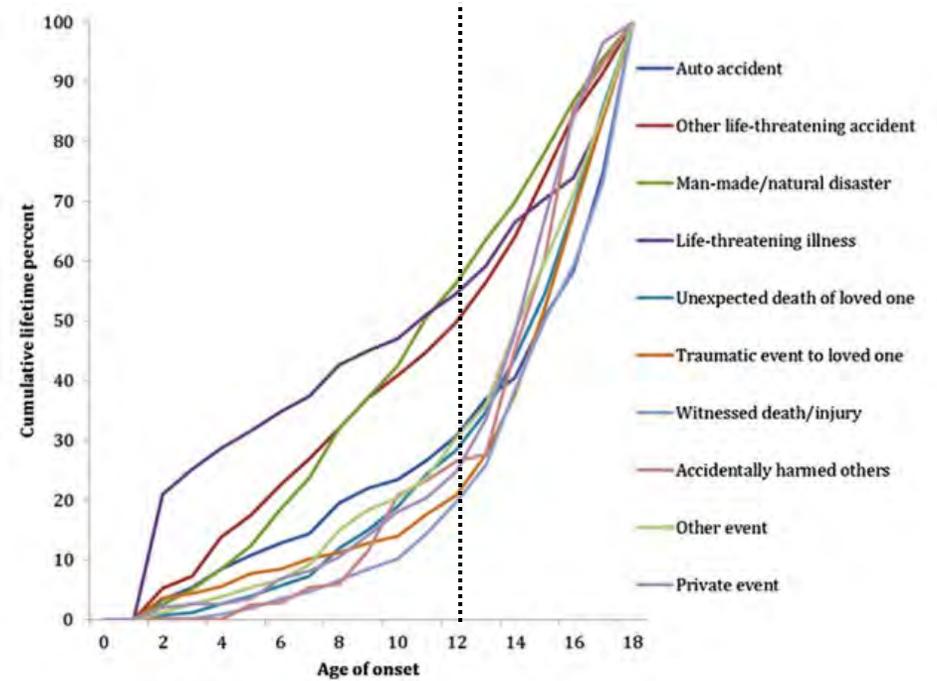


Trauma exposure increases markedly in adolescence

Interpersonal violence

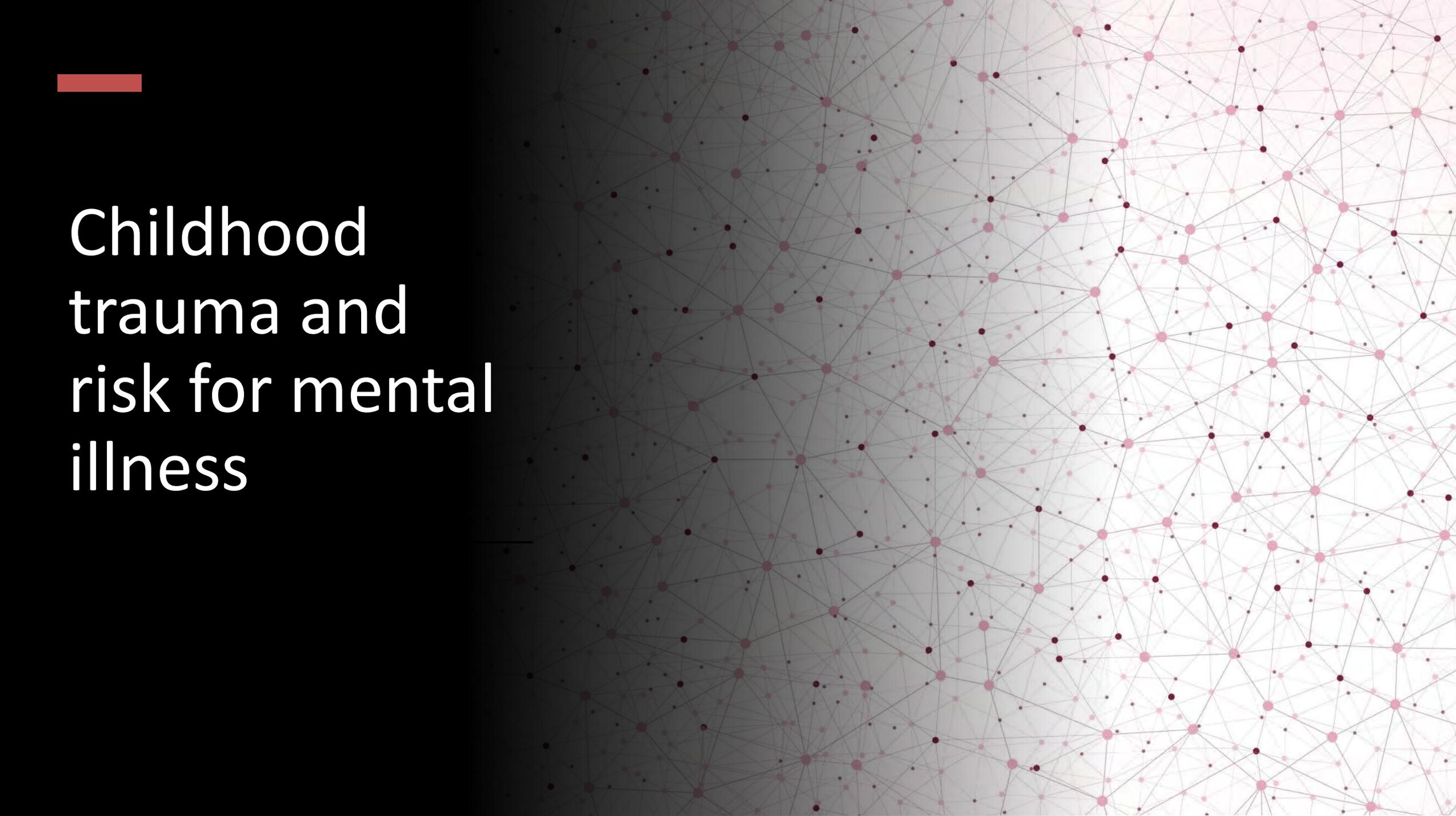


Other events





Childhood trauma and risk for mental illness

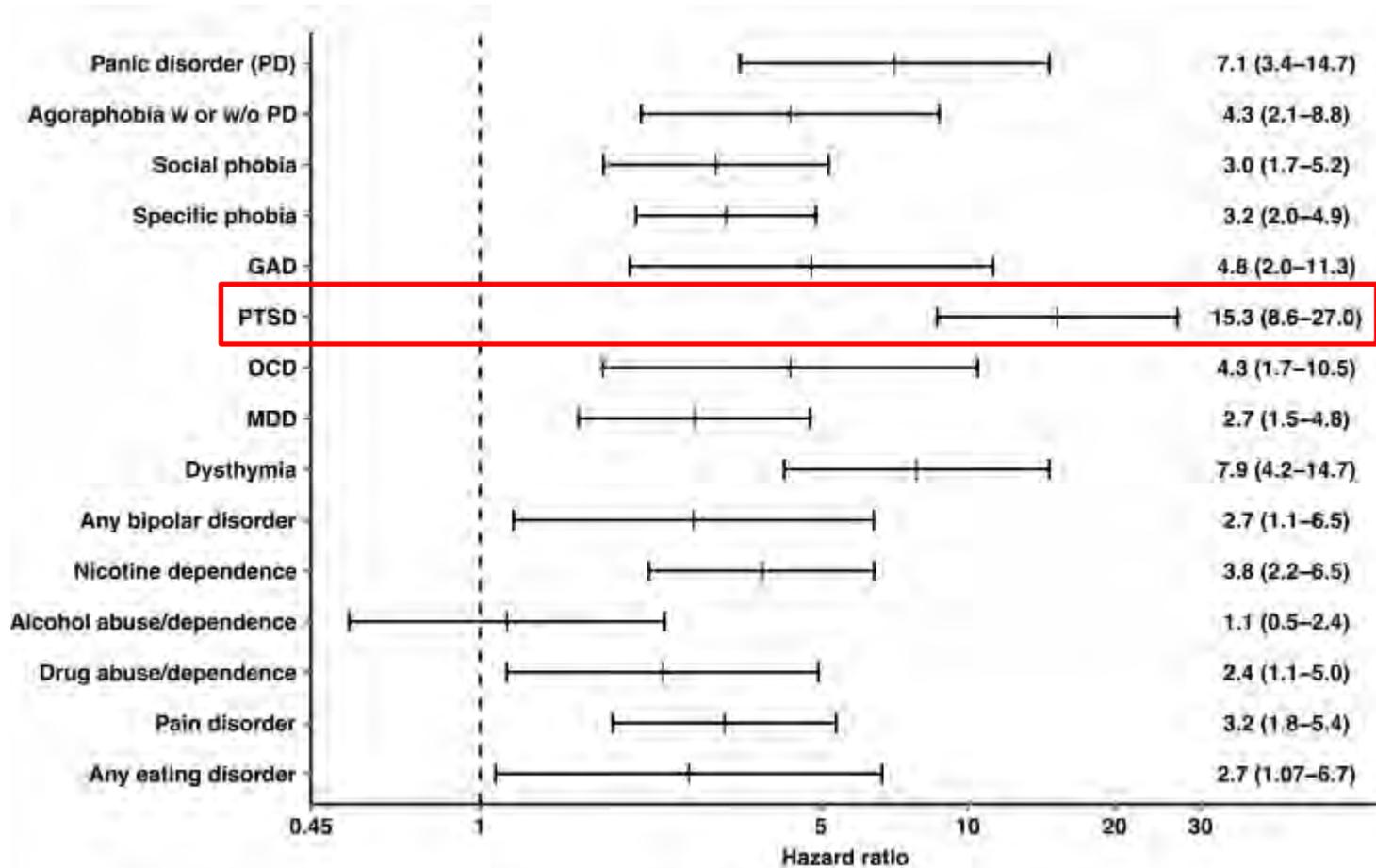
The background of the slide is a complex network of interconnected nodes and lines. The nodes are represented by small circles in various colors, including dark grey, light grey, pink, and red. The lines connecting them are thin and light grey, creating a dense, web-like structure that fills the entire background. The overall aesthetic is modern and data-driven.

Trauma increases risk for numerous mental illnesses in youth

- Of trauma exposed youth...
 - 29% experience major depression
 - 23% have conduct disorder
 - 25% experience PTSD
 - 25% have self harm
 - 8% have a suicide attempt



PTSD carries the highest risk of all mental illness for first suicide attempt in young people



<https://www.helpyourteens.com>

Question: 50%
of all PTSD cases
begin by what
age?

a) 17

b) 23

c) 29

d) 35

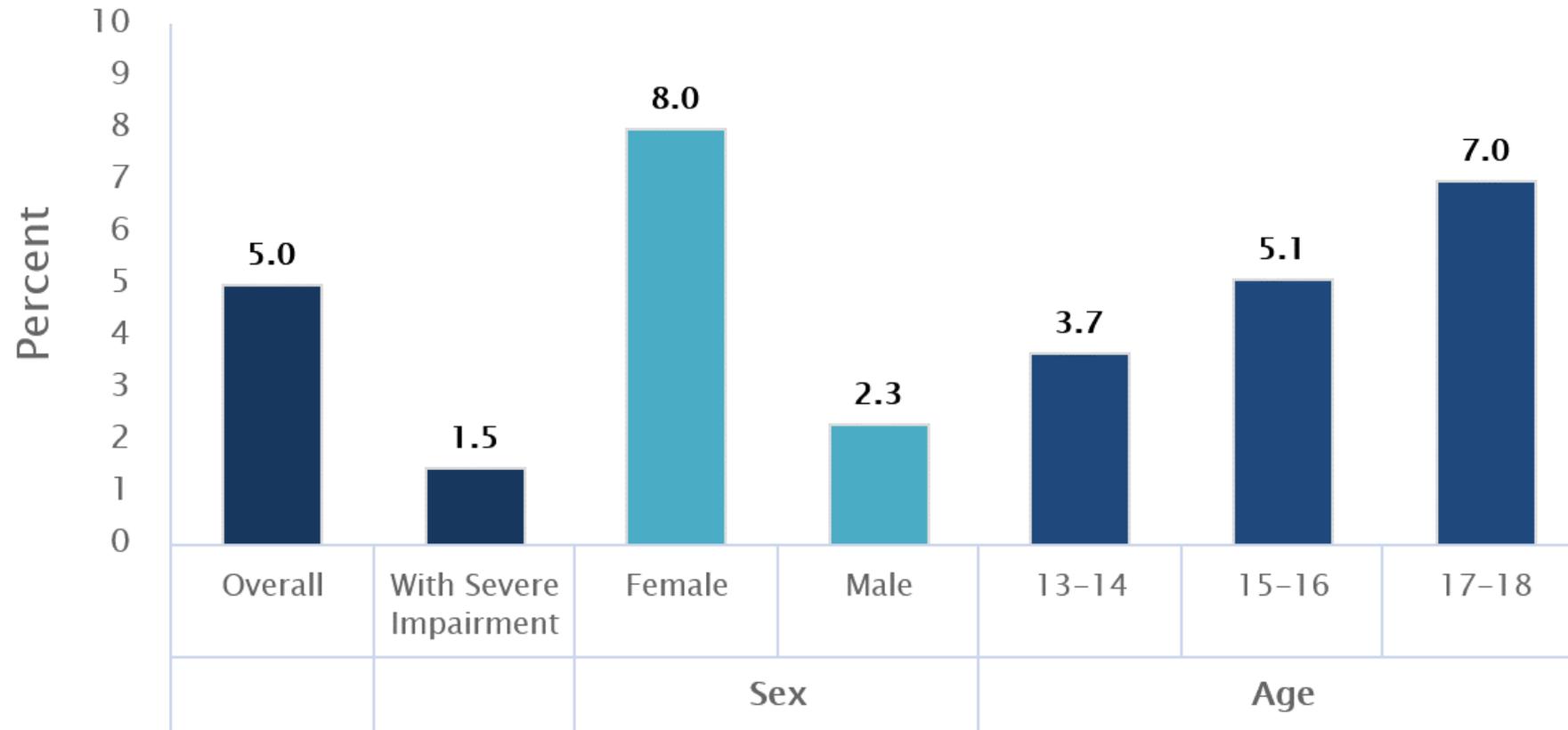
How common is PTSD in kids?

- PTSD lifetime prevalence
 - Youth: 5%
 - Adults: 7%
 - Veterans: up to 30%
- PTSD in youth varies by type of trauma:
 - 7% of motor vehicle accident victims
 - 30-40% following interpersonal violence
- Symptoms may be delayed (45% in adults)



By: Ciaran Walsh

PTSD rises dramatically in adolescence, especially in females



What are risk factors for PTSD in youth?

- **Pre-trauma**
 - Female sex
 - Prior internalizing disorder or PTSD
 - Prior trauma load
 - IQ
- **Peri-trauma**
 - Trauma characteristics
 - Interpersonal violence
 - Direct exposure
 - Acute pain
 - Parental acute stress
- **Post-trauma**
 - Intrusive ruminations
 - Social support



<http://kidsagainstdivorce.org>

PTSD: DSM-5-TR

A. Exposure to a traumatic event:

Exposure to actual or threatened death, serious injury, or sexual violence. Direct or indirect

B. Intrusion (one):

1. Intrusive memories or repetitive play
2. Nightmares
3. Flashbacks or reenactment
4. Psychological distress with reminders
5. Physiological reactivity with reminders

C. Avoidance (one):

1. Avoidance of thoughts or feelings
2. Avoidance of external reminders

D. Altered cognition/mood (two)

1. **Dissociative amnesia**

2. **Negative beliefs**

3. **Distorted blame (self/others)**

4. Persistent negative emotions

5. Anhedonia

6. Detachment

7. Restricted positive affect

E. Hyperarousal (two):

1. Irritability/aggression

2. **Destructive/reckless behavior**

3. Hypervigilance

4. Exaggerated startle response

5. Poor concentration

6. Insomnia

E. Duration more than 1 month



PTSD Specifiers

- **Dissociative Specification.** In addition to PTSD, the individual experiences persistent or recurrent symptoms of either:
 - Depersonalization. Experience of being an outside observer of or detached from oneself (dream-like or sense of unreality of self).
 - Derealization. Experience of unreality of surroundings (e.g., "things are not real").
- **Delayed Specification.** Full diagnostic criteria are not met until at least six months after the trauma(s), although onset of symptoms may occur immediately.

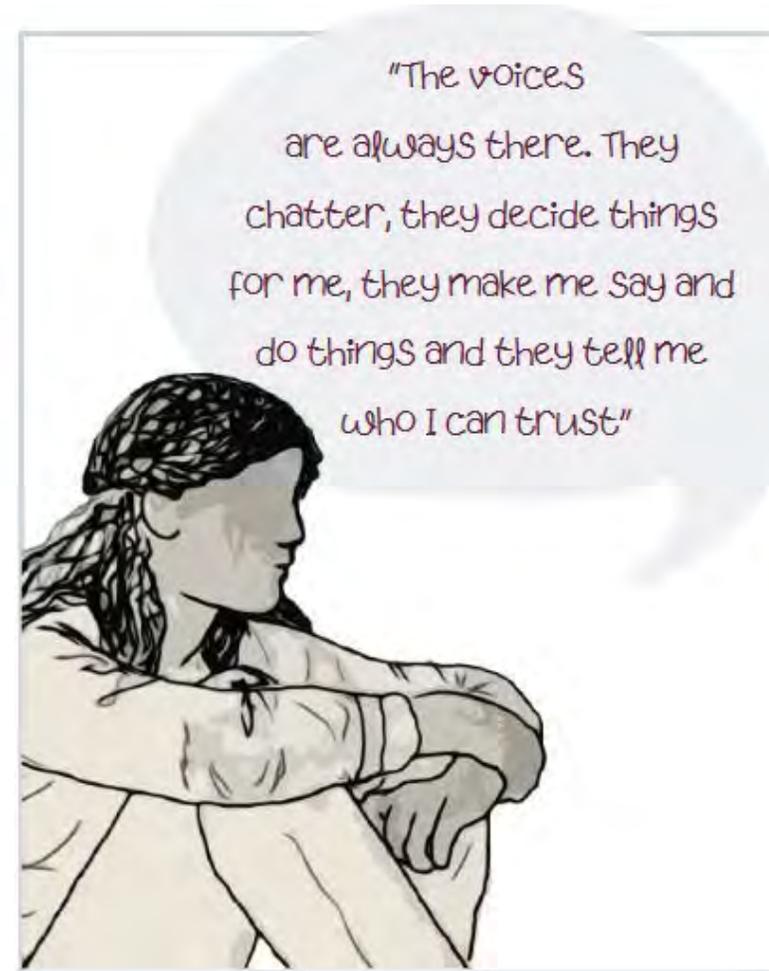
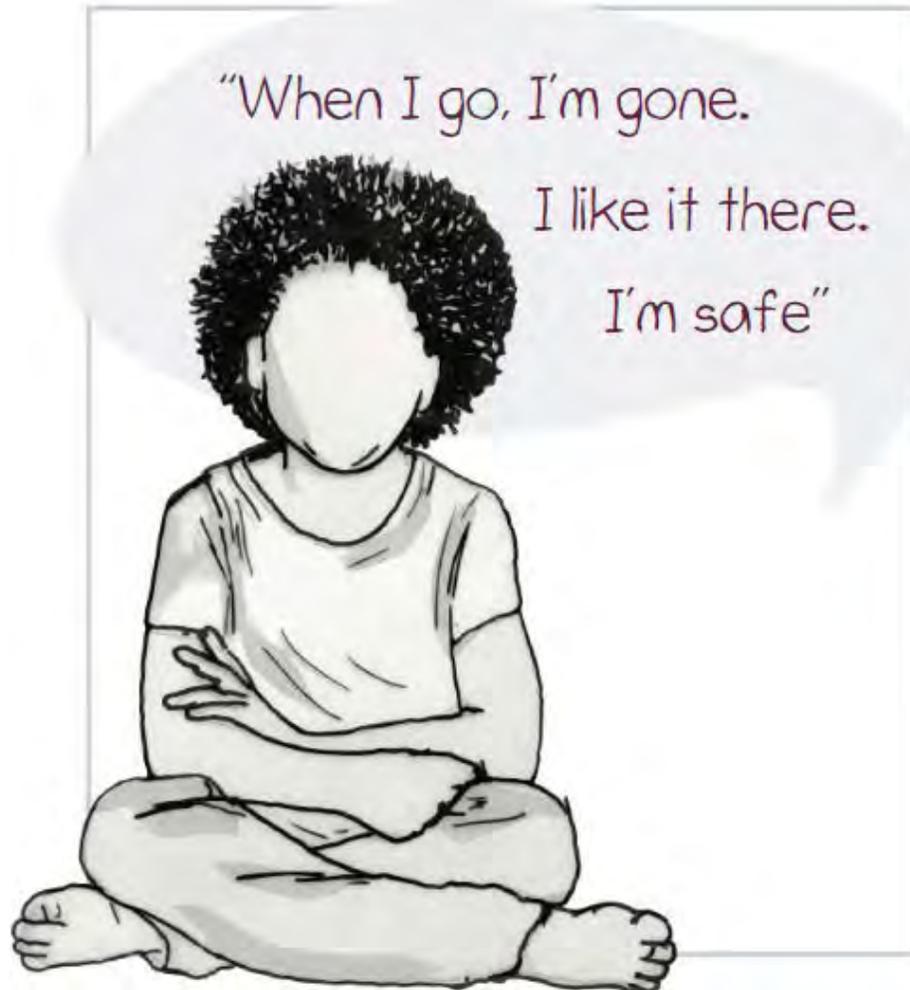
Adolescents show wider range of dissociative symptoms than adults

“Psychological functions like attention, thinking, feeling, memory, perception, and identity separate from conscious awareness in response to overwhelming trauma” – NCTSN

- DSM-5 dissociative/high PTSD
 - More reported trauma and maltreatment
 - Depersonalization/derealization less common than other dissociative symptoms
- Dysphoric arousal - dissociative amnesia, emotional detachment, numbing
 - May have higher unrecalled traumas, show fewer classic PTSD symptoms

Look for other dissociative symptoms in adolescents

Daydreaming, amnesia, dissociative avoidance





Question:
Roughly what
percentage of
youth with PTSD
have a comorbid
mental illness?

a) 30%

b) 50%

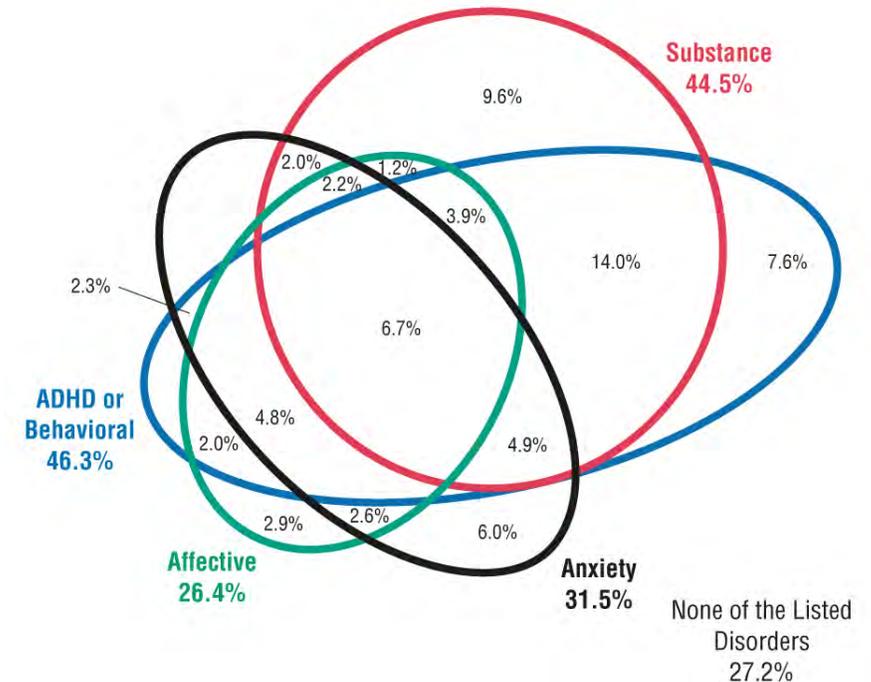
c) 70%

d) 90%



Psychiatric comorbidity is the rule in PTSD

- 68% of kids with PTSD have a comorbid illness
 - ADHD 37%
 - Social phobia 31%
 - GAD 30%
 - Mood disorders 28%
 - Substance use disorder >20%
 - Behavioral disorder 16%



Abram et al 2003

Developmental trauma disorder not in DSM but gaining recognition

Syndrome related to multiple and chronic childhood traumas

15 possible symptoms across several domains, including emotion, cognition, behavior, and relationships

E.g. low self-esteem, extreme distrust and attachment difficulties, aggression, dissociation, cognitive difficulties

Treatment modalities: adapted TF-CBT, ARC (attachment, self-regulation, competency) – added emphasis on emotion regulation, awareness, self-esteem, primary attachments



Treatment of pediatric PTSD





Can we prevent PTSD?

- No proven therapies that prevent PTSD
- Small trials suggest possible benefits of beta antagonists, morphine
- Psychological First Aid and Skills for Psychological Recovery
 - Focused on enhancing safety, social supports, problem solving, coping skills

NCTSN
The National Child Traumatic Stress Network

GET HELP NOW

WHAT IS CHILD TRAUMA? ▾ TREATMENTS AND PRACTICES ▾ TRAUMA-INFORMED CARE ▾ RESOURCES ▾ ABOUT US ▾

SEARCH

OUR MISSION is to raise the standard of care and improve access to services for traumatized children, their families and communities throughout the United States.

DEFINING CHILD TRAUMATIC STRESS ▸



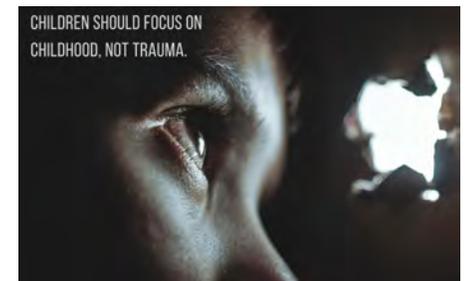


Question: What is the most evidence-based therapy for pediatric PTSD?

- a) Prolonged exposure
 - b) EMDR
 - c) Family therapy
 - d) Trauma-focused CBT**
 - e) CPT
- 

Trauma-focused psychotherapy

- Psychotherapy is the first-line treatment of PTSD in youth
 - Effect sizes: $g=.5$ short term (<6 mth), $g=.38$ longer term (>6 mth)
- Concomitant reductions in depressive and anxiety symptoms
- Primary evidence-based psychotherapies
 - Trauma-focused cognitive behavioral therapy (TF-CBT, $d=.3$)
 - Eye movement desensitization and reprocessing (EMDR, $d=.4$)
 - Narrative exposure therapy (KidNET)
 - Prolonged exposure (PE)
 - Cognitive processing therapy (CPT)



TF-CBT Steps

- **P**sycho-education
- **P**arent management skills
- **R**elaxation skills
- **A**ffective identification
- **C**ognitive coping
- **T**rauma narrative
- **I**n vivo exposure and mastery
- **C**onjoint parent-child sessions
- **E**nhancing safety and skills





<http://childtrauma.org/>

TF-CBT for preschoolers

- Modified version of TF-CBT
 - Cartoon based psychoeducation
 - Graduated exposure through drawing, imaginal, in vivo
 - Parent present with child in 3 sessions, watching all others
 - Medium to large effect sizes in preliminary studies

Scheeringa et al 2011

Eye movement desensitization and reprocessing (EMDR) can work for youth

- Emotion regulation skills (e.g. setting a mental safe place)
- Processing traumatic memories, identifying imagery, beliefs, body sensations
- Desensitize with visual distraction, holding left/right buzzers, others
- May be helpful for youth with difficulty verbalizing trauma or dissociation



Clinical guidance for dissociation in youth

- Assess for the presence of dissociation for children and adolescents who have trauma exposure
 - Adolescent Dissociative Experiences Scale (ADES), Child Dissociative Checklist (CDC)
- Define dissociation broadly, beyond just depersonalization and derealization
 - E.g. dissociative amnesia, dissociative avoidance, daydreaming
- Safety, therapeutic alignment, validation, grounding exercises in context of trauma-based therapy



Question: Which medications are approved to treat pediatric PTSD?

- a) fluoxetine
 - b) sertraline
 - c) escitalopram
 - d) none of the above**
- 

Pharmacotherapy for pediatric PTSD is limited

- No FDA approved medications
- Few studies of SSRIs suggest no benefit
- D-cycloserine failed to enhance cognitive therapy
- Benzodiazepines should be avoided
- Case reports suggest adrenergic blockade could be helpful (clonidine, propranolol)



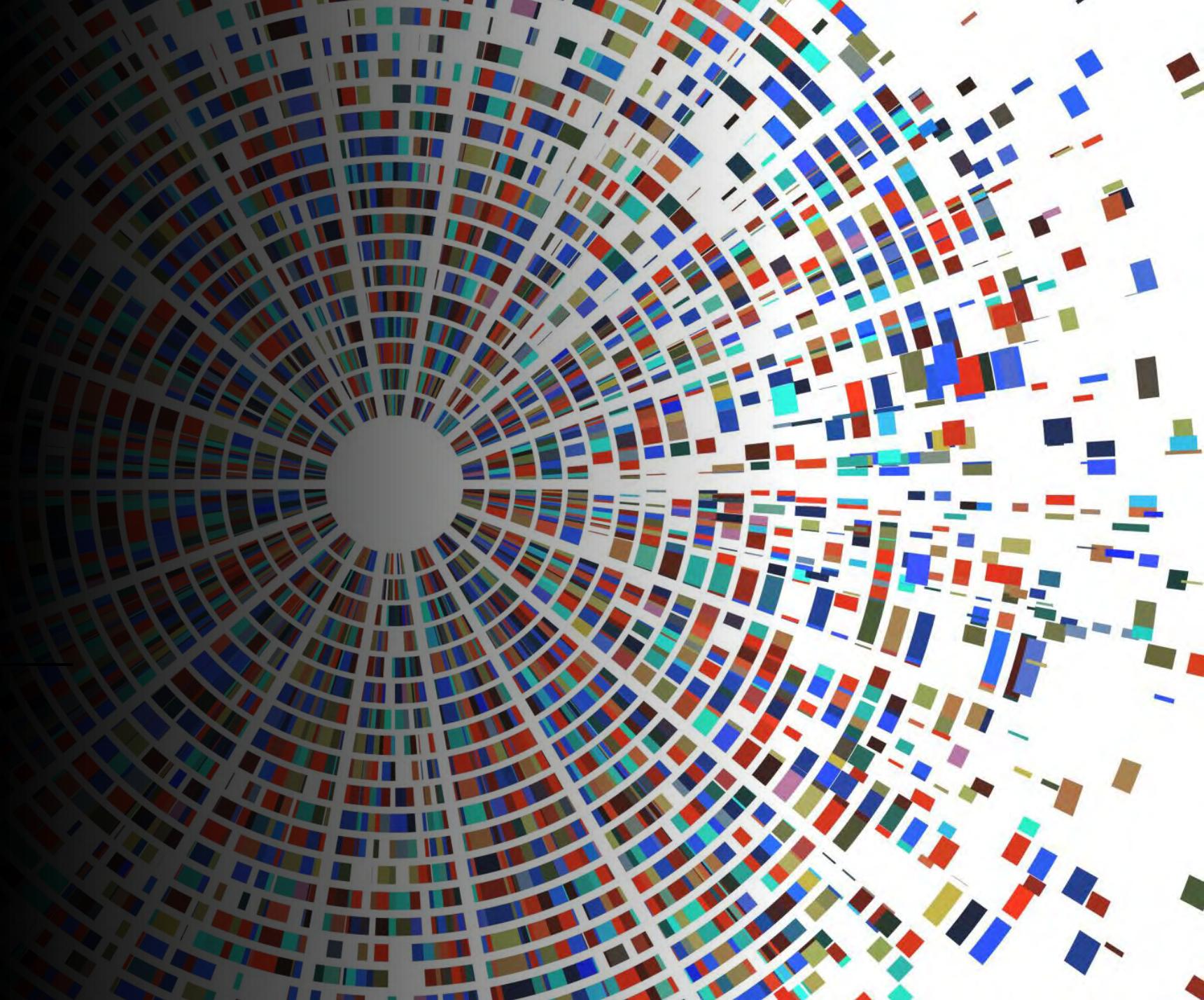
Medications for comorbid illness can still be helpful

- Depressive and anxiety disorders: SSRIs/SNRIs
 - note black box warning for suicidality
- ADHD: stimulants, alpha-2 agonists
- Insomnia: melatonin, alpha-2 agonists, antihistamines, trazodone



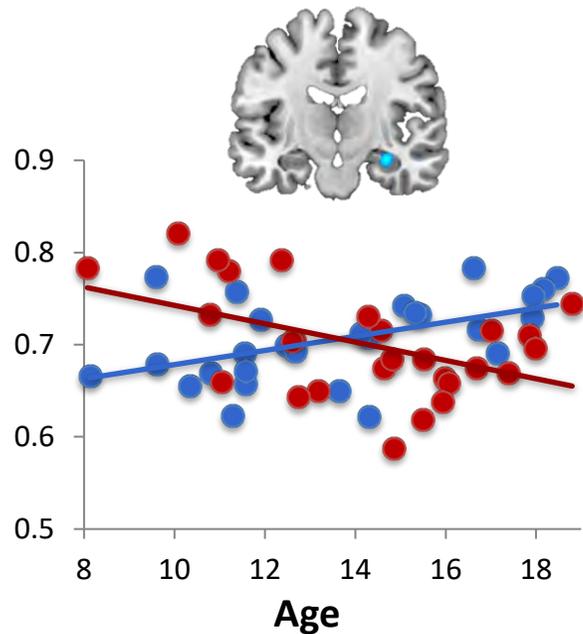


Neurobiology of pediatric PTSD

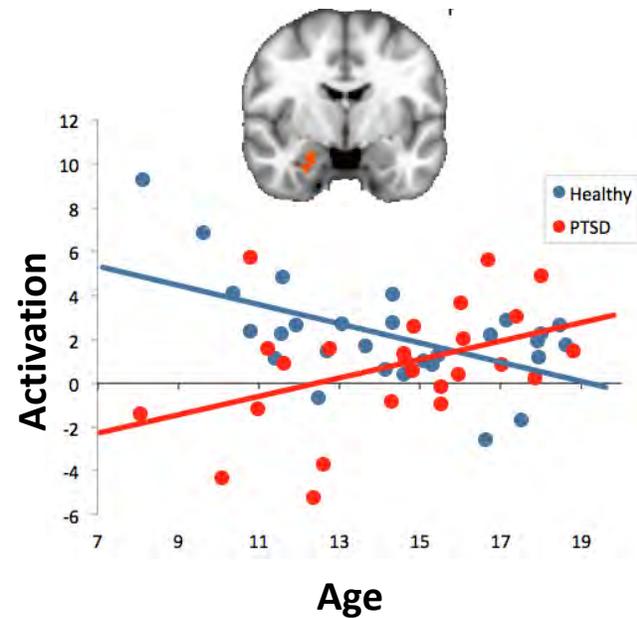


Pediatric PTSD is a neurodevelopmental disorder

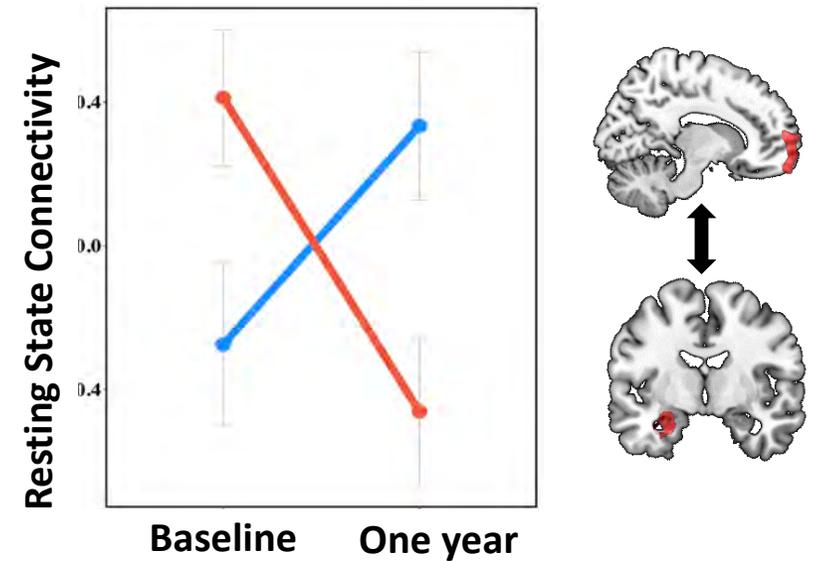
Decreased hippocampal volume with age



Increased amygdala activation with age

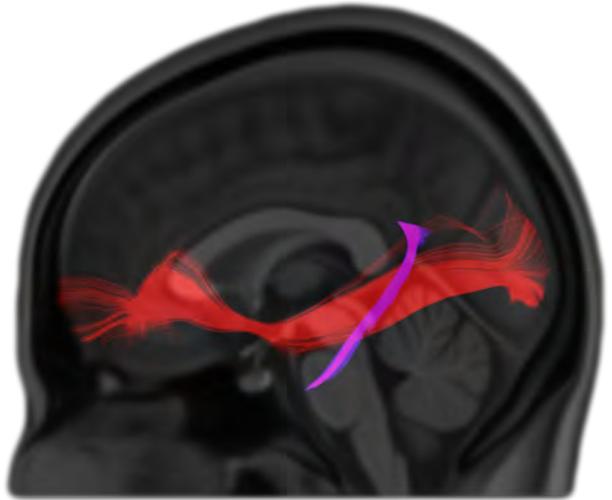


Decreasing prefrontal-amygdala connectivity over time

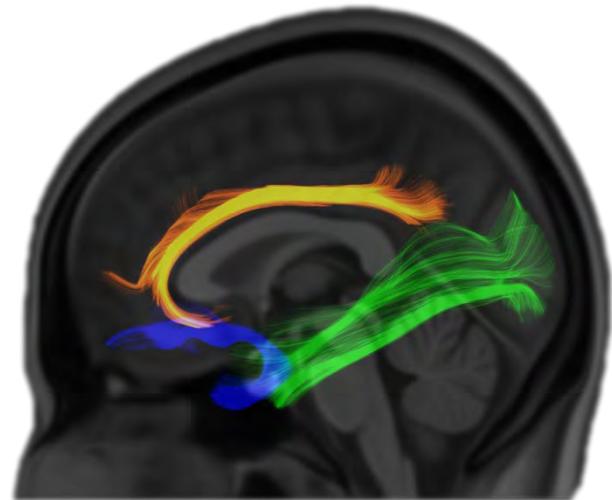
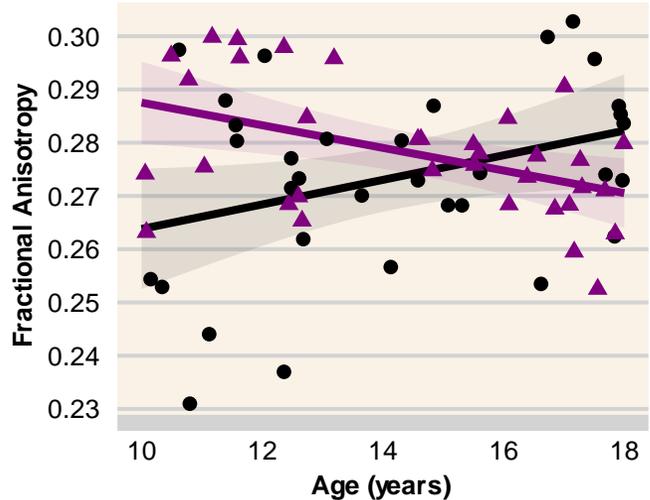


● Typically Developing
● PTSD

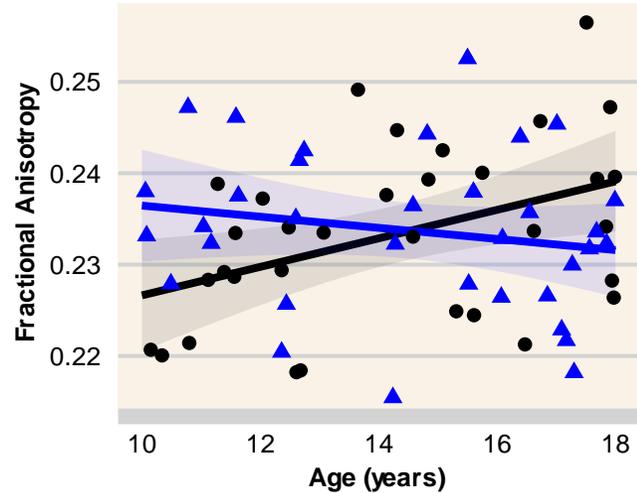
Decreased white matter integrity with age in pediatric PTSD



Cingulum bundle



Uncinate fasciculus

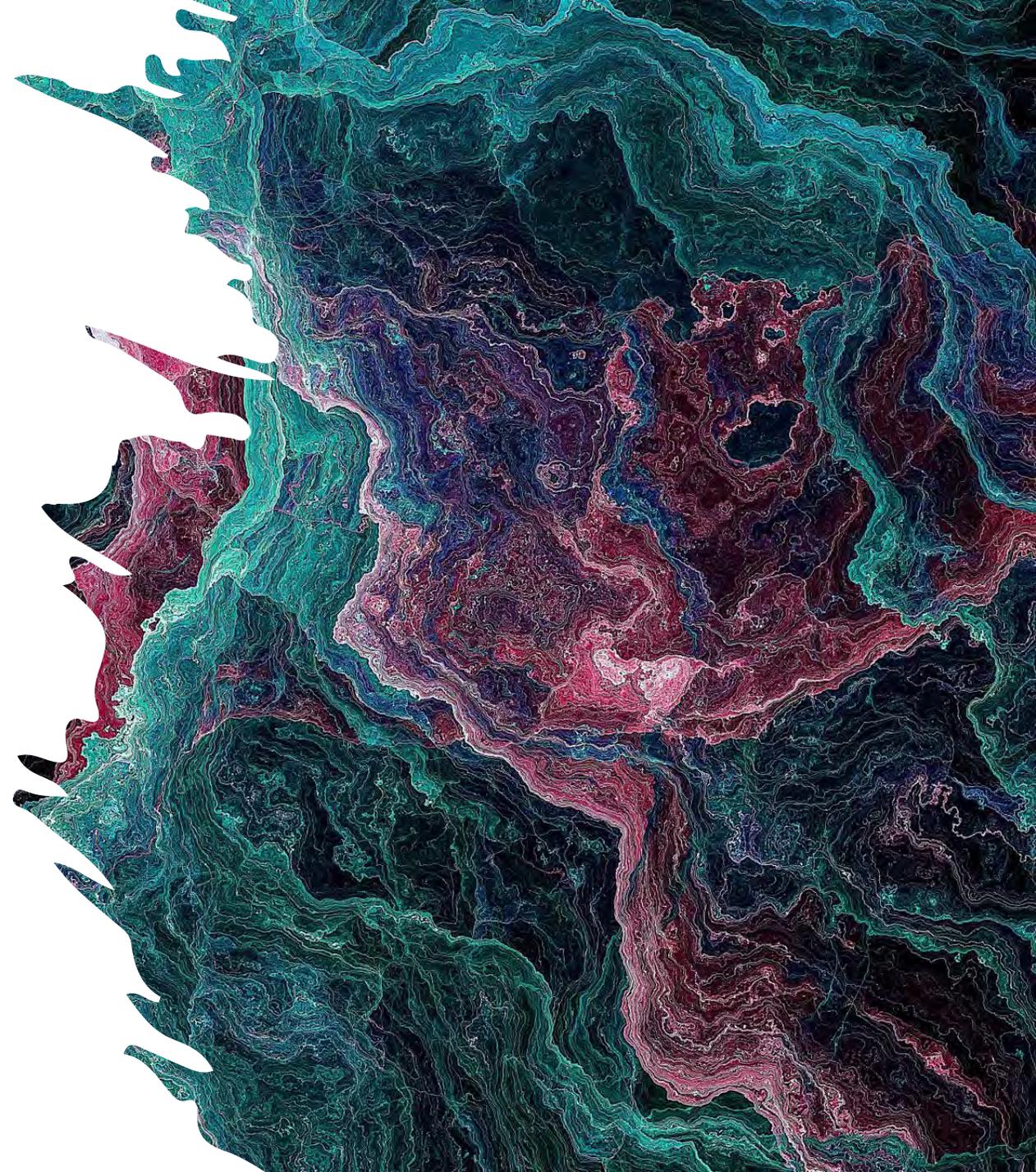


Early stress
neuroadaptation?

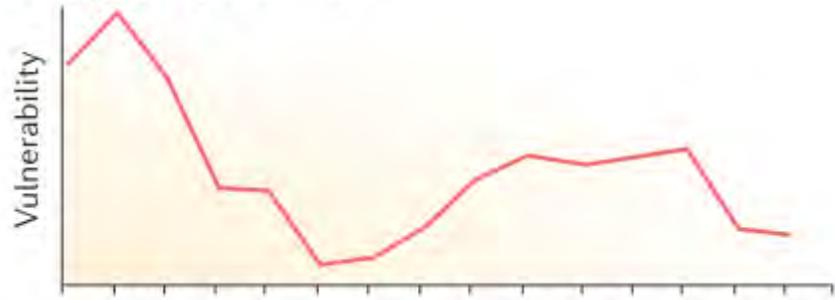
Stress-induced
maturation in emotion
circuitry?

Developmental effects of
persistent stress/PTSD?

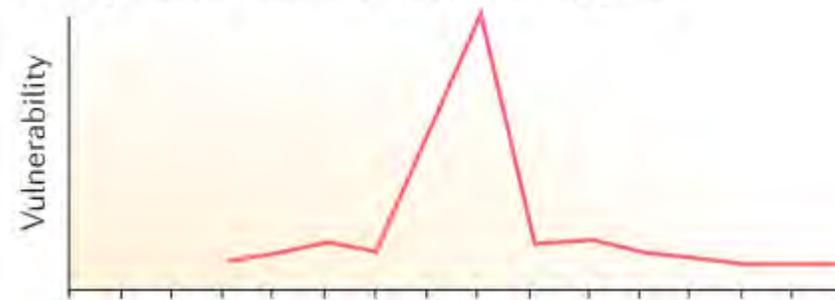
Developmental timing of
trauma?



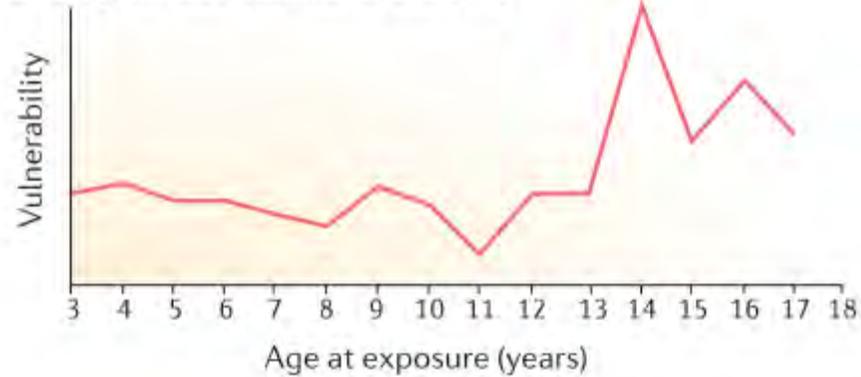
a Hippocampal volume



c Grey-matter volume of the right amygdala

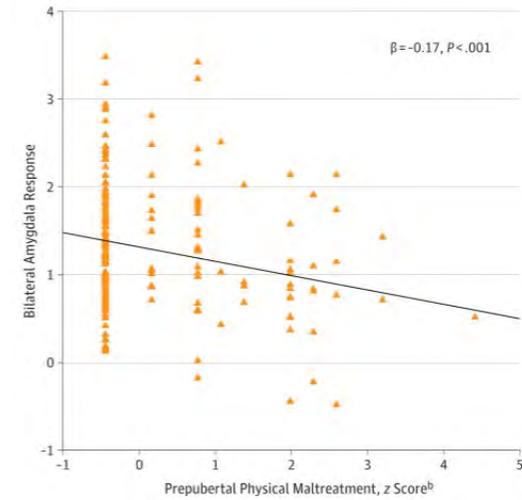


e Grey-matter volume of the PFC

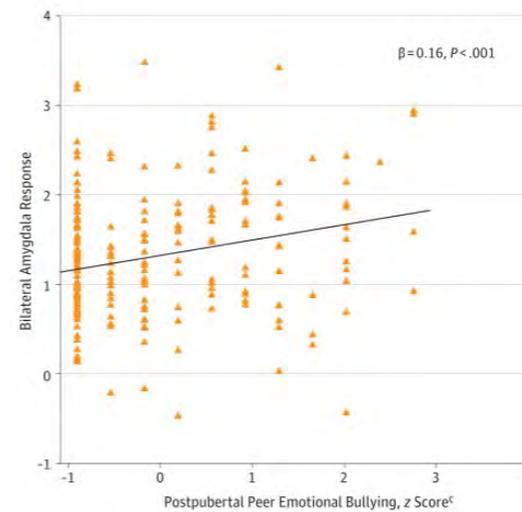


Teicher, 2016

Prepubertal stress and decreased amygdala reactivity



Postpubertal stress and increased amygdala reactivity



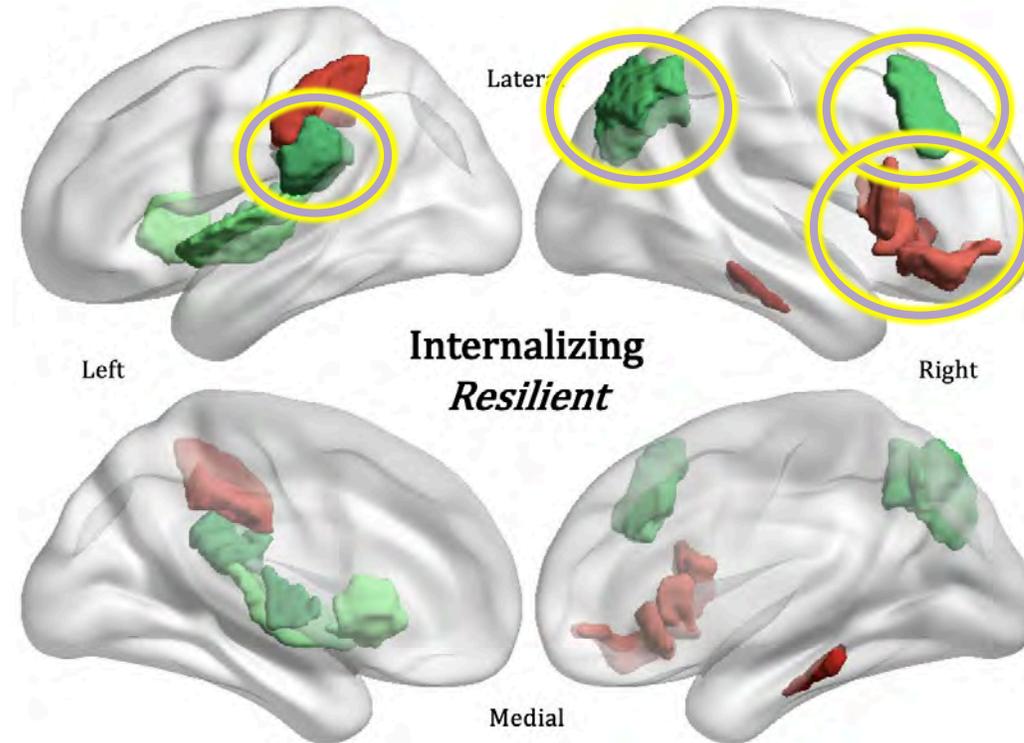
Zhu, 2019

Unique regional influences on brain maturity in resilient female youth

Executive Network

Dorsolateral prefrontal cortex,
Lateral inferior parietal lobule

Increased maturity



Threat (Salience) Network

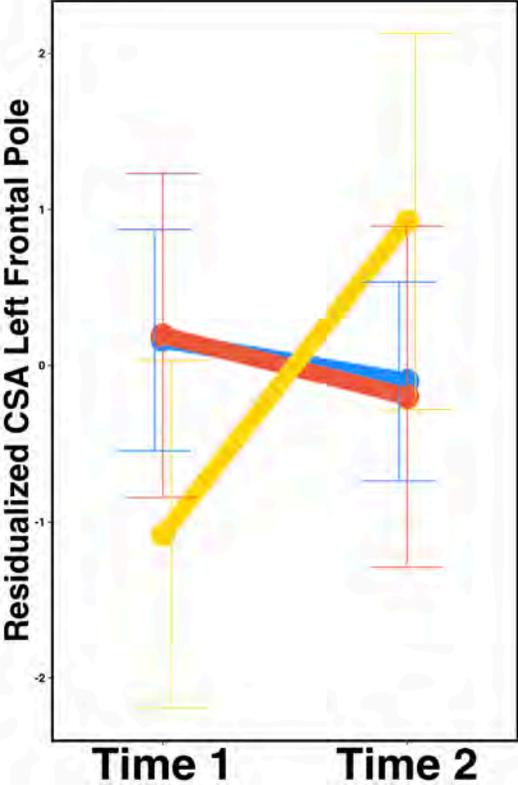
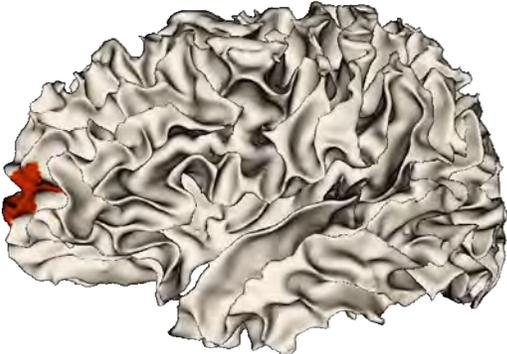
Anterior insula,
Lateral orbitofrontal cortex,
Opercular cortex (pars orbitalis)

Decreased maturity



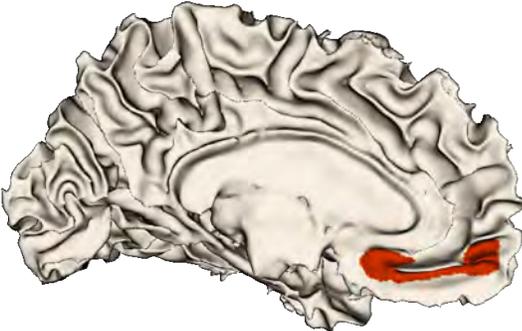
PTSD remission in youth: Cortical expansion

Frontal pole surface area expansion

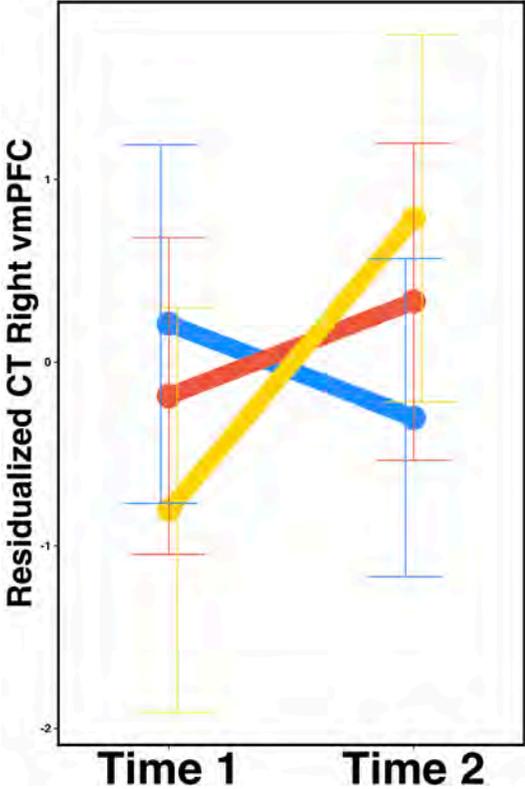


- Typically Developing
- PTSD Nonremitter
- PTSD Remitter

Ventromedial PFC thickness expansion

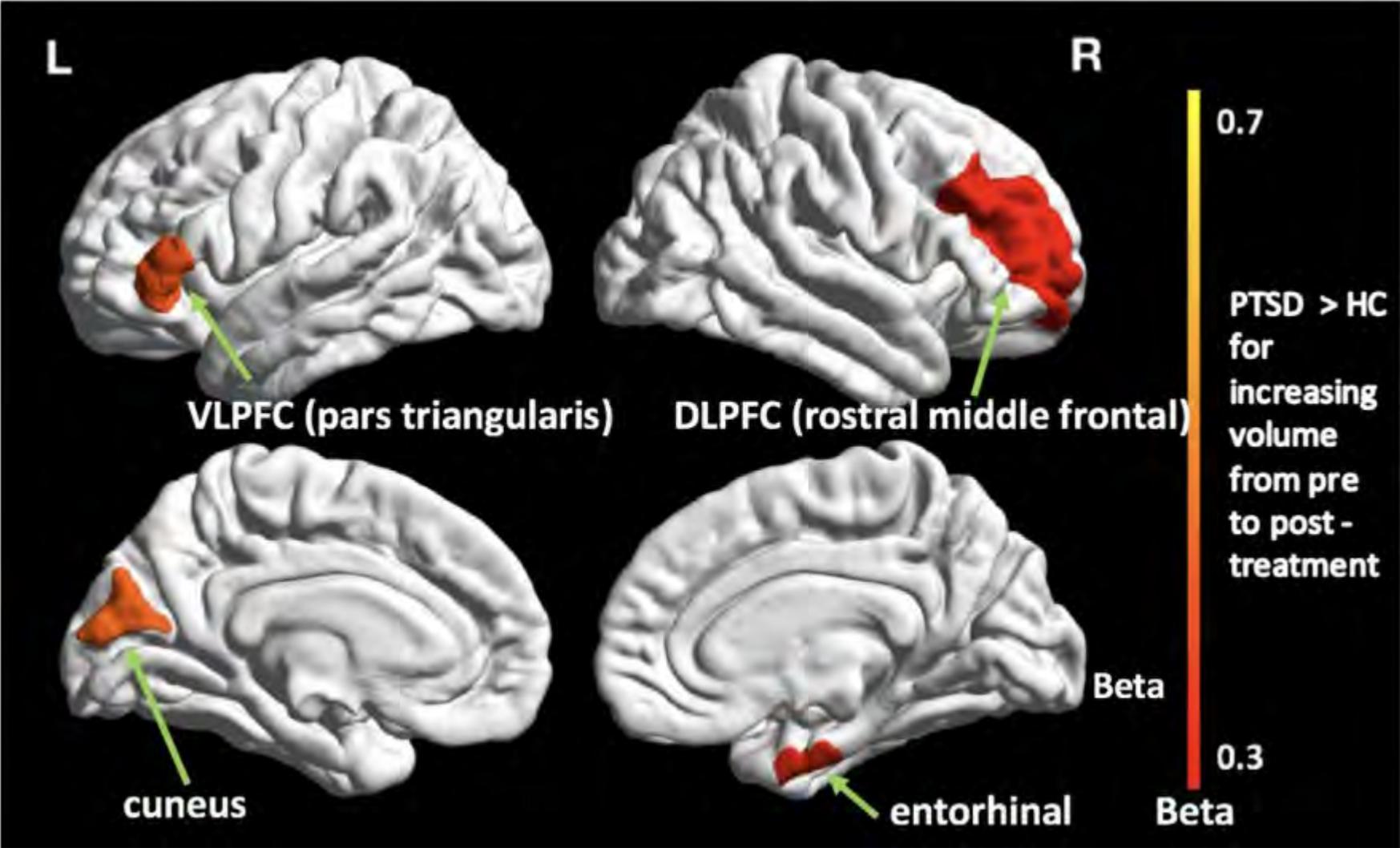


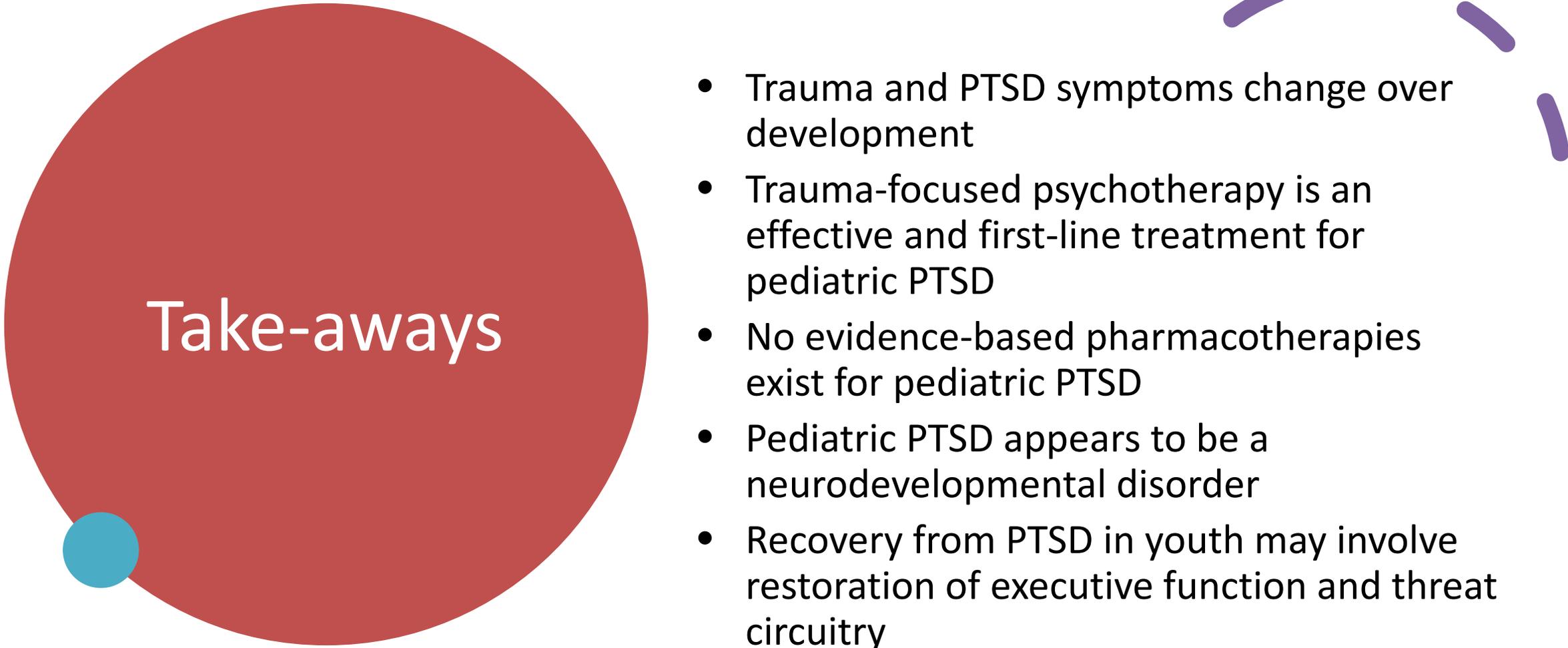
↓ anxiety symptoms



Heyn et al 2019

Expansion of executive control circuits with TF-CBT





Take-aways

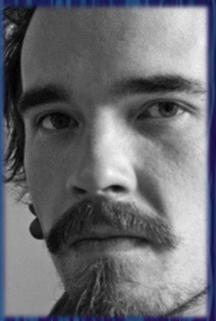
- Trauma and PTSD symptoms change over development
- Trauma-focused psychotherapy is an effective and first-line treatment for pediatric PTSD
- No evidence-based pharmacotherapies exist for pediatric PTSD
- Pediatric PTSD appears to be a neurodevelopmental disorder
- Recovery from PTSD in youth may involve restoration of executive function and threat circuitry

Virtual reality biofeedback to improve emotion regulation in trauma-exposed youth

DEEP



MICHAEL TOWNSEND



ANDY MOONEY



SARAH TICHO



JOANNEKE WEERDMEESTER, PhD



ISABELA GRANIC, PhD



OWEN HARRIS



NIKI SMIT



MARIEKE VAN ROOIJ, PhD

DEEP VR: Virtual reality breathing biofeedback



 **BRAIN & BEHAVIOR**
RESEARCH FOUNDATION
Awarding **NARSAD** Grants



DEEP-VR is engaging and associated with improved emotion regulation in youth

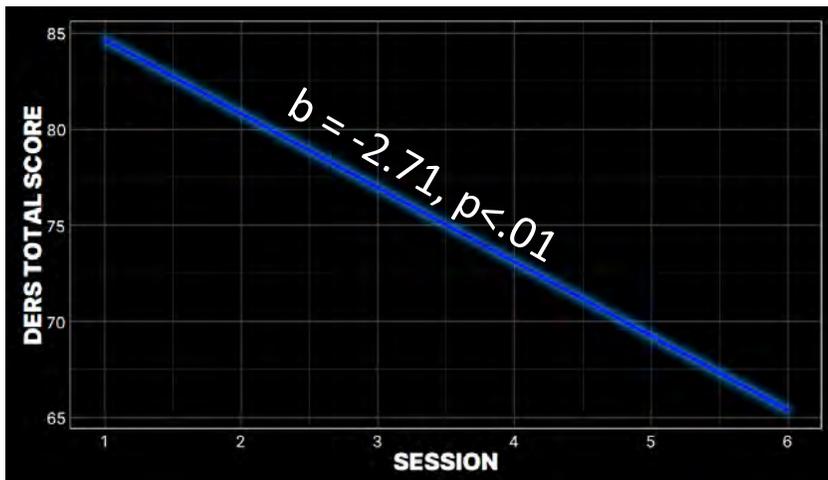
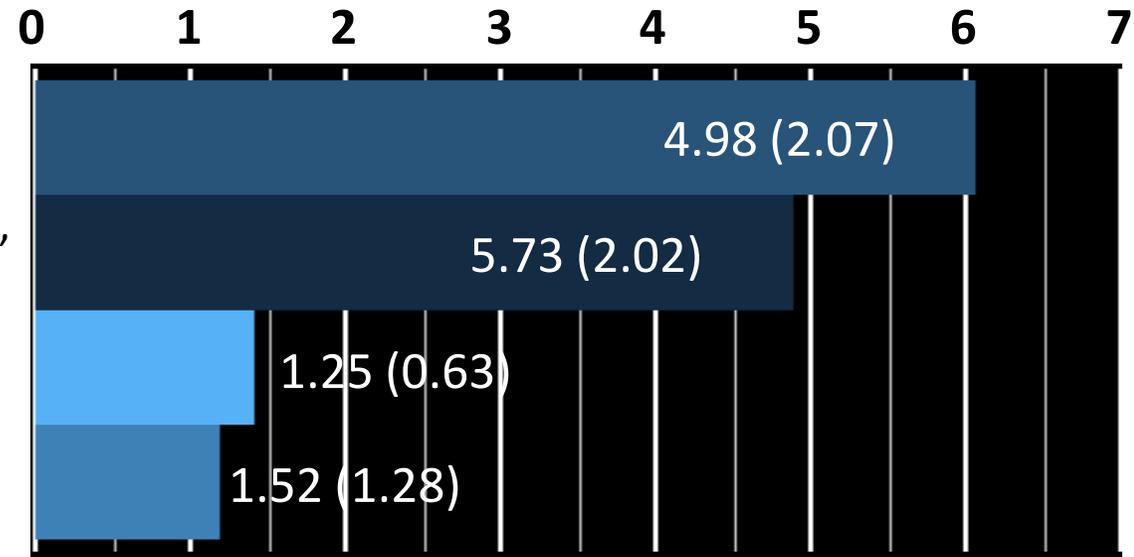
Virtual Reality Questionnaire (VR-Q)

“I felt like I was really there inside the virtual environment.”

“I found the virtual environment to be engaging and enjoyable.”

“I found the virtual environment boring.”

“I found this task demanding.”



Improved emotion regulation (decreased DERs score) across sessions

Resources

- [National Child Traumatic Stress Network](#)
 - Psychological First Aid and Skills for Psychological Recovery
- [National Center for PTSD](#)
- [TF-CBT Web](#)
- [Pediatric PTSD overview](#)
 - Russell et al, *Am J Psychiatry* 2023
- [Child Trends](#)

