Neuroscience of Stress: Coping and Resilience

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inspire

INSPIRATIONAL INSTRUCTION
Thought leaders in education sharing topics to inspire the best teaching and support social emotional learning

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Today’s Guest Speakers

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Introductions

Respond to the poll to tell us a little about yourself.

https://ling-app.com/tips/hello-different-languages/
Outline

• Biological Markers of Stress and Trauma
  • Cortisol
  • Brain Structure and Function
• Strengthening the Child: Strategies
  • Cue-Centered Treatment
  • The Pure Power Curriculum
39% of college students had anxiety disorders.

51% of high school students experienced anxiety.

40% of early childhood teachers showed signs of depression.

42% of principals considered leaving.

75% of K-12 teachers felt anxious.

95% of school leaders’ feelings were “negative.”

Anxious, Fearful, Worried, Overwhelmed, Sad
Engaging Activity: Even In – Even Out
Nature vs Nurture

GENES  \rightarrow  ENVIRONMENT

\downarrow

STRESS  VULNERABILITY

\downarrow

RESILIENCE  PTSD  ANX/DEP
100 Billion Neurons/Trillions of Synapses/Pruning and Myelination

https://www.gettyimages.com/illustrations/neurons-firing
HPA Axis ➔ Cortisol

Trends in Cortisol Levels Across Time of Day: HLM Analysis

Weems et al., 2009 Journal of Pediatric Psychology
Processing a Traumatic Event

http://neuroscience.mssm.edu/nestler/brainRewardpathways.html
Posttraumatic stress disorder symptoms and cortisol at baseline predicted hippocampal reduction over an ensuing 12- to 18-month interval.

Left and right hippocampal activation during retrieval found to be greater in the HC group compared to the PTSS group. Clusters are overlaid upon a standardized template brain in an axial view (left: z = -18) and a coronal view (right: y = -20). No areas of the left or right hippocampus were found to be display greater activation during retrieval in the PTSS group compared to the HC group.
Percentage of total voxels within the right hippocampus activated (p < .05) when comparing retrieval versus the control condition in the HC and PTSS group.
Executive Function
PFC & Cortisol

- 45 youth (15 HC) aged 10-16 years – imaging
- 33 youth aged 10-16 years – salivary cortisol

**Results:**

- Youth with PTSS had significantly **decreased total brain tissue** and **total cerebral gray volumes** in comparison to healthy controls.

- While controlling for total cerebral gray volume, the PTSS group demonstrated **decreased left ventral** and **left inferior** prefrontal gray volumes.

- A significant negative association was found between pre-bedtime **cortisol levels** and **left ventral PFC** gray volumes for the full sample.

FMRI Executive Function via Response Inhibition Task

Control > PTSS

PTSS > Control

SIB > Non-SIB

Carrion et al. 2008 Depression and Anxiety
Correlation of Insula Activation with PTSD Symptom Severity

\[ \rho = 0.80; \ p = 0.01 \]
Amygdala Early Activation when viewing Angry Faces

Garrett et al 2012 Depression and Anxiety
Diminished PFC Activation when viewing Fearful Faces

Garrett et al. 2012 Depression and Anxiety
Engaging Activity: Think-Ink-Share

Where do you feel stress in your body?

Where do you feel joy in your body?
Engaging Activity: Starfish Breathing or Take Five
Neuroscience of Pediatric PTSD
by Victor G. Carrión and Carl F. Weems

• Summary of key work done in areas pertinent to function and development.
• Address advances in the neuroscience of executive function, memory, emotional processing and associated features such as dissociation, self-injurious behaviors and sleep regulation.

August 2017 | Hardcover
Nature
Neuroplasticity

• Most active during development
• Clear impact of trauma on key regions
• Aerobic exercise promotes neurogenesis
• Best improvements: PFC and hippocampus
• Molecular and network levels
  • Strengthening/weakening of synapses
  • Strengthening/weakening of pathways
The Need for Treatment

• Without treatment, PTSD can potentially become a chronic condition
• Even those who recover from PTSD are likely to relapse
• Due to their developmental level, youth may be particularly vulnerable to trauma’s effects
• Trauma can also result in many other problems, including academic, social and emotional difficulties.
Cue-Centered Therapy for Youth Experiencing Posttraumatic Symptoms
A Structured Multimodal Intervention, Therapist Guide
by Victor G. Carrión

- Developed for therapists treating the complex clinical scenarios of chronically traumatized children
- Emphasizes the importance of empowering children to become their own agents of change
- Allows therapists flexibility in conducting each session and leaves room for them to apply their own strengths
- Utilizes a hybrid of interventions shown to be effective when treating traumatized children
- Tailored specifically for the treatment of children who experience ongoing adversity

January 2016 | Paperback
Cue-Centered Therapy

• **A short-term** (15-18 sessions), **psychosocial treatment** for children and adolescents who have experienced trauma

• **Multimodal**: a hybrid of effective interventions

• **Flexible**: can be adapted based on youth’s age, developmental level, background, and current functioning

• Designed to address trauma’s impact on **four core domains**:
  - Cognition
  - Emotion
  - Behavior
  - Physiology
PTSD Symptoms and Sessions

Level 1 HLM analyses indicated a significant linear, coefficient = -2.84, t (500) = -6.72, p < .001 and curvilinear (quadratic) change, coefficient = 0.13, t (500) = 5.60, p < 0.001
Learning

• Operant Conditioning
  + Reinforcement
  - Reinforcement

• Classical Conditioning
  • UCS -> UCR (Threatening Situation)
  • CS -> CR (Non-Threatening Situation)
Fearful Faces Task Overview

Each stimulus is one of:

- fearful face
- calm face
- null (blank)

2 sec  →  4-9 sec (average 6.5, uniformly distributed at half second marks)  →  2 sec

... 60 trials
CCT Group: Cortical Response (Time 2 – Time 1)

Fearful Faces

Decreased activation:
• Left DLPFC
Prevention: Pure Power Curriculum
Largest Multi-Method CONTROLLED Longitudinal YOUTH Yoga Study in US
Multi-Method Design Allows For Testing of Models

- Improved Sleep
- Brain Function Improvements (Emotion Regulation & Execute Functioning)
- Improved SEL
- Behavioral Change
- Academic Improvement
Increased Total Sleep Time (Minutes) Following Curriculum (p=.04)
Increased REM Sleep (Minutes) Following Curriculum (p=.04)

Curriculum: Dose-Response

Pre-Curriculum
Higher Diurnal Cortisol Associated with more REM in Does-Response Group

Pre-Curriculum

Curriculum: Dose-Response
After the intervention, there was a decrease in average intensity ratings of aversive images in the fMRI task.
Amygdala activation is associated with emotional responses: in particular fear, anxiety, and aggression. Amygdala hyperactivity is seen in a variety of psychopathologies including PTSD and exposure to early life stress. After the mindfulness intervention, children in the intervention group showed decreased amygdala reactivity to aversive images.

Decreased Amygdala Reactivity After Intervention

Amygdala Reactivity

- Control T1
- Control T2
- Intervention T1
- Intervention T2

N_{Control} = 14, N_{Intervention} = 11
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- AACAP
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All Resources are Free
Pure Edge Website:
Pureedgeinc.org
No Cost Inspire Module: Coping with Teacher Stress
We are grateful for everything you do!
Thank you

GET INSPIRED.
A Brief Follow Up Survey Will Launch
We Appreciate Your Feedback!

National Suicide Prevention Lifeline
1-800-273-8255
suicidepreventionlifeline.org