Hidden Scars: The Impact of Maltreatment on Young Peoples’ Minds and Brains

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Objectives

At the conclusion of this session, participants should be able to:

• Explain the psychological effects of maltreatment on psychological outcome
• Summarize the extant knowledge about effects of maltreatment on brain structure and function
• Outline implications of these findings for clinical care, prevention, and future research
What is maltreatment?

- **Physical abuse**: harsh corporal punishment or beating that leaves scars and causes the victim to fear for safety
- **Sexual abuse**: coercive sexual activity, with the most severe being vaginal or anal penetration
- **Emotional abuse**: harsh constant criticism and rejection, threat of abandonment
- **Physical Neglect**: lack of care for basic physical needs resulting in endangerment or abandonment, with physical or medical consequences
What is maltreatment?

• Emotional neglect: Lack of interaction, encouragement, and attachment to child
• Exposure to domestic violence: witnessing violence toward spouse or parental figure
• Different forms of maltreatment often co-occur
Psychosocial correlates of maltreatment

Also often co-occur with other adversities:

- poverty
- low parental education
- food insecurity
- parental mental disorder and criminality
- housing instability
- neighborhood violence
- poor schooling
The diagram illustrates the relationship between deprivation, threat, and complex exposures. It shows how different types of exposure, such as neglect, institutionalization, poverty, community violence, domestic violence, and physical/sexual abuse, are distributed across a spectrum of low and high deprivation, as well as low and high threat. The diagram highlights how these exposures are typically found in typical developmental environments, whereas complex exposures are more likely to occur in high-threat, high-deprivation situations.
Assessment of adversity

• **ACES**—assesses different types of childhood adversity
• **CTQ**—28 item self-report of abuse/neglect
• **CECA**—interview of abuse, harsh parenting, neglect
• **TESI**—exposure to trauma and abuse
• **MACES**—self-report for young adults on abuse, neglect, exposure to domestic violence
• **YV-ACES**—Assessment of abuse, neglect, adversity
Two-item screen for abuse*

• When I was growing up, people in my family hit me so hard that it left me with bruises or marks.

• When I was growing up, someone tried to touch me in a sexual way or tried to make me touch them.

• 84.8% sensitivity, 88.1% specificity

*Thombs et al., 2007
Challenges to assessment

• Retrospective
• Confounded by psychiatric disorder
• BUT......
• Concordance with sibling recall
• Similarity outcomes in retrospective and prospective studies
## Frequency of maltreatment (%)

<table>
<thead>
<tr>
<th>Study</th>
<th>Physical abuse</th>
<th>Sexual abuse</th>
<th>Neglect</th>
<th>Domestic Violence</th>
<th>Any</th>
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<tr>
<td>ACES</td>
<td>28</td>
<td>21</td>
<td>10/15</td>
<td>13</td>
<td></td>
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<tr>
<td>Green</td>
<td>8.4</td>
<td>6.0</td>
<td>8.6</td>
<td>14</td>
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<td>Keyes</td>
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<td>0.2-1.1</td>
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<td>12</td>
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<tr>
<td>Scott (prosp)</td>
<td></td>
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<td></td>
<td></td>
<td>10.3</td>
</tr>
</tbody>
</table>

(Green et al., 2009; Keyes et al., 2012; Scott et al., 2012)
DEVELOPMENTAL TIMING OF CHILD MALTREATMENT AND SYMPTOMS OF DEPRESSION AND SUICIDAL IDEATION IN YOUNG ADULTHOOD
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Dunn et al. Depression and Anxiety. 2014; 30(10): 955-964
Sequelae of Maltreatment

- Psychiatric disorder
- Suicide attempt
- Risk behaviors
- Obesity
- Tobacco, drug, and alcohol use
- Premature mortality
- Victimization
- Criminal justice involvement
- Lower academic and employment attainment
- Days out of role
The ACE Score and the Prevalence of Attempted Suicide

- ACE Score 0: 0%
- ACE Score 1: 3%
- ACE Score 2: 7%
- ACE Score 3: 15%
- ACE Score >=4: 20%
ACE Score and Drug Abuse

Percent With Health Problem (%)

ACE Score

- 0
- 1
- 2
- 3
- 4
- >=5

Ever had a drug problem

Ever addicted to drugs

Ever injected drugs

Robert F. Anda. Overview of the Adverse Childhood Experiences (ACE) Study Slides
The ACE Score and the Prevalence of Severe Obesity (BMI $\geq 35$)
Sequelae of early adversity

• Dating violence— 46.7% have hx of maltreatment (Miller et al., 2011)
• Early sexual initiation, sexually risk behaviors, prostitution
• Running away
• Higher rate of same sex cohabitation— but don’t know if result of abuse, or perpetrators seek out gender non-conforming youth
ACE Score and the Risk of Being a Victim of Domestic Violence

Women

Men

Risk of Victimization (%)

ACE Score

Robert F. Anda. Overview of the Adverse Childhood Experiences (ACE) Study Slides
Psychiatric sequelae

- Higher rates of nearly all disorders
- High proportion of disorders attributable to maltreatment
- Disorders have earlier onset and worse outcome
- Less responsive to treatment
Population attributable risk (%) of psychiatric disorder: age of onset effects

- Childhood
- Adolescent
- Young adult

- mood
- Anxiety
- Behavior
- Substance
- All
Delayed Effects – Silent Period

A. Maltreatment and Drug Use
   - Drug Use (%)
   - Physical and/or Sexual Abuse
   - No Abuse

B. Drug Use (days/month)
   - ACE Score > 5
   - ACE Score = 0

C. Binge Drinking
   - HED Frequency
   - Age (years)
Moderation of CBT Response: Abuse and Comorbidity*

**Abuse History**

![Graph showing rate of positive response for abuse history with p-values p<0.05 and p=0.06]

**Number of Comorbid Disorders**

![Graph showing rate of positive response for number of comorbid disorders with p-values p<0.01, p=0.13, and p=1.00]

No CBT

CBT

*Asarnow et al., 2009*
Neurobiological findings

• What regions of the brain are affected?
• Relationship of region of brain to timing and type of maltreatment
• Structural and functional changes
• Reversibility
• Clinical implications
Brain development proceeds in a series of stages that vary across regions.

Stress-vulnerable brain circuits involved in emotional processing

Effect of stress exposure on the size of the hippocampus and prefrontal cortex in young adults.

From: Preliminary Evidence for Sensitive Periods in the Effect of Childhood Sexual Abuse on Regional Brain Development

Andersen et al., 2008
Corpus collusum

- Involved in inter-hemispheric integration and communication
- Shift between “emotional” and “rational brain”
Projections of the corpus collusum

From Martin H. Teicher, MD, PhD. Child Abuse, Brain Development and Psychopathology presentation, 3/16/2012
Childhood abuse affects corpus callosum

The morphology of the corpus callosum is significantly affected by early neglect (as well as physical abuse and sexual abuse).

Teicher et al. (2004) Biological Psychiatry 56, 80-85
Using Diffusion Tensor Imaging we found that the integrity of the middle portion of the corpus callosum correlated inversely with degree of exposure (ACE score) to childhood abuse in young adults (n = 153).
Corpus Callosum - Rostral Body

Abused at index age vs abused at other ages

Hippocampus

• Involved in memory formation and access
• Affected by glucocorticoid levels (toxic, cause cell loss, interfere with myelination)
• Affect HPA axis (stress response)
• Affect dopaminergic input to striatum—related to reward response
Childhood maltreatment (Childhood Trauma Questionnaire [CTQ] scores) is negatively associated with right hippocampal gray matter volume.
Relationships between hippocampal gray matter volume, childhood maltreatment, and trait anxiety ($N = 818$)

Gorka et al. Biology of Mood & Anxiety Disorders. 2014; 4:12
The relationship between recent life stress (LESS) and current anxiety symptoms (MASQ-AA).

Gorka et al. Biology of Mood & Anxiety Disorders. 2014; 4:12
Age of maltreatment and hippocampal volume

Hippocampus

Abused at index age vs ctl

Effect Size (eta squared)

Index Age of Abuse (years)

Amygdala

- Involved in emotional reactivity
- In circuitry with vmPFC that can either engage or disengage emotional response
- Change in volume
- Change in responsivity
Childhood maltreatment (Childhood Trauma Questionnaire [CTQ] scores) is positively associated with right amygdala responsiveness to negative facial expressions.

Connectivity between mPFC and hippocampus and amgydala decreases with greater severity of maltreatment
Prefrontal cortex

- Planning, self-monitoring, self-awareness
- Attention
- Motivation
- Executive function
- Inhibition
- Working memory
Reduced prefrontal cortical gray matter volume in young adults exposed to harsh corporal punishment
Relationships between mPFC gray matter volume, childhood maltreatment, and trait anxiety ($N = 818$)
The relationship between recent life stress (LESS) and current anxiety symptoms (MASQ-AA)

Gorka et al. Biology of Mood & Anxiety Disorders. 2014; 4:12
Prefrontal Cortex

Abused at index age vs abused at other ages

Do specific types of abuse have specific effects?

- Some evidence of specific effects based on the type of maltreatment
- Sexual abuse and visual associative cortex
- Verbal abuse and tracts related to language processing
Repeated Exposure to Childhood Sexual Abuse

Reduces gray matter volume 14.1% in left primary and secondary visual cortex.

Gray matter volume and visual memory

Verbal Abuse affects tracts related to language processing and verbal IQ

Years of exposure to interparental verbal aggression (unaccompanied by physical violence) and fractional anisotropy in the inferior longitudinal fasciculus.

Reversibility?

• Romanian orphans institutionalized with low contact with attachment figures
• Some assigned to foster parents at variable ages
• Reversibility of some deficits if fostered at <24 months
Change in EEG in neglected orphans who received foster care <24 mos of age

Vanderwert et al., 2010
Summary

• Brain changes due to impact of maltreatment at different ages
• Likely that impact of different type of abuse differ, as well as differences between neglect and abuse
• Abuse: fear circuitry
• Neglect: reward?
What can we do?

- **Prevention of maltreatment:**
  - Nurse-Family partnership: 48% reduction
  - Parent Child Interaction Therapy (PCIT)—19% vs. 49% re-abuse (NNT=3)
  - Child-parent education centers—52% reduction
  - Durham Family Initiative—57% reduction
  - Triple P—22% reduction, 17% decline in abuse-related injuries to the ED
  - Safe Environment for Every Kid (SEEK)—screening in primary care followed by social work intervention
What can we do: early detection

• Screen for maltreatment and adversity
• Have protocol for referral
• Referral to programs that preserve family and teach more adaptive parenting skills
What we can do: indicated prevention to reduce risk for substance abuse, depression, risk behaviors

• Augmentation of family resiliency
  – Parental monitoring
  – Positive parenting
  – Appropriate, consistent discipline

• Amelioration of cognitive distortion and bias (fear response, hostile attribution)
  – CBT, cognitive bias training

• Teach child adaptive problem-solving and emotion regulation skills

• Teach child how to recognize exploitative situation.

• Educational and social support
Management of depression with history of maltreatment: Heightened reactivity to negative emotional stimuli

• Techniques to use prior to cognitive restructuring
  – Cognitive bias modification
  – Exposure and desensitization
  – Trauma narrative
  – Teach emotion regulation strategies prior to bringing up emotionally distressing issues
Management of depression with history of maltreatment: Impaired executive function and ability to engage in cognitive re-appraisal

• Executive function training
• Spend longer in training in cognitive re-appraisal
• Bypass cognitive restructuring and focus on problem-solving and behavior activation
• Alternative forms of treatment: Family Based Attachment Therapy, Interpersonal therapy
Management of depression with history of maltreatment: Low reward response

• May be especially prominent in those with a history of neglect
• Behavior activation
• Use of antidepressants like bupropion?
Conclusions

• Maltreatment is a common and significant contributor to adolescent psychiatric problems
• Affects course and treatment outcome
• Importance of prevention of maltreatment
• Specific treatment responses in maltreated youth suggested by functional deficits
  – *emotion reactivity*— need to train in emotion regulation prior to CBT and desensitize
  – *executive function* — exec function training, cognitive bias modification, practice in cognitive re-appraisal, bypass CBT processes
  – *reward response* -- BA
Acknowledgement

• We acknowledge with gratitude the Pennsylvania Legislature for its support of the STAR-Center and our outreach efforts
Thank you for your attention!

• For copies of these slides, please email Joseph Park at parkj5@upmc.edu
Management of depression

• Consider family and environmental contexts: family discord, psychopathology
• Ongoing victimization: peer and romantic exploitation
• Other risk behaviors also more common
• Greater sensitivity to ongoing life events