Biological & Psychosocial Effects of Peer Victimization

Daniel S. Pine, MD
Emotion & Development Branch
Outline

- Scope of Problem
- Genetics
- Peripheral Biological Indices
- Brain Structure & Function
Outline

• Scope of Problem

• Genetics

• Peripheral Biological Indices

• Brain Structure & Function
Bullying/Peer Victimization

- Common but understudied
- Impactful
- Complex
- Unique
Bullying/Peer Victimization

- Common but understudied
Bullying/Peer Victimization

- Common but understudied
  - Range of values
  - Definitions, methods
  - Groups
    - Victims ~25%
    - Bullies ~10%
    - Both ~5%

Witnessed?
Bullying/Peer Victimization

- Common but understudied

- Range of values

- Definitions, methods

- Groups
  - Victims ~25%
  - Bullies ~10%
  - Both ~5%

<table>
<thead>
<tr>
<th>Variables</th>
<th>Childhood/adolescent (ages 9–16)</th>
<th>Adulthood (ages 19 and 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjects, n</td>
<td>1,309</td>
<td>759</td>
</tr>
<tr>
<td>Observations, % (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4,870</td>
<td>1,131</td>
</tr>
<tr>
<td>Female</td>
<td>52.5 (2,678)</td>
<td>54.6 (575)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>89.7 (3,227)</td>
<td>89.7 (679)</td>
</tr>
<tr>
<td>American Indian</td>
<td>4.4 (1,386)</td>
<td>4.1 (399)</td>
</tr>
<tr>
<td>African American</td>
<td>5.9 (257)</td>
<td>6.2 (53)</td>
</tr>
<tr>
<td>Victims, no. of exposures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>75.7 (3,568)</td>
<td>73.7 (810)</td>
</tr>
<tr>
<td>1</td>
<td>18.9 (950)</td>
<td>19.2 (213)</td>
</tr>
<tr>
<td>2</td>
<td>3.9 (249)</td>
<td>5.1 (70)</td>
</tr>
<tr>
<td>3+</td>
<td>1.6 (103)</td>
<td>2.0 (38)</td>
</tr>
<tr>
<td>Bully, no. of exposures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>92.1 (4,317)</td>
<td>88.9 (964)</td>
</tr>
<tr>
<td>1</td>
<td>6.8 (440)</td>
<td>8.9 (127)</td>
</tr>
<tr>
<td>2</td>
<td>1.0 (100)</td>
<td>1.9 (32)</td>
</tr>
<tr>
<td>3+</td>
<td>0.1 (13)</td>
<td>0.3 (8)</td>
</tr>
</tbody>
</table>

Copeland et al. 2014, 2015
Bullying/Peer Victimization

• Impactful
Bullying/Peer Victimization

- Mental Health
- Physical Health
- Success
Bullying/Peer Victimization

- **Mental Health**
- **Physical Health**
- **Success**

- **Long-term** (>10 years)

- **Psychopathology**
  - **Victims** emotional problems
  - **Bullies** conduct problems

*McDougall & Vaillancourt 2015*
Bullying/Peer Victimization

- **Mental Health**
- **Physical Health**
- **Success**

- **Long-term (>10 years)**

- **Psychopathology**
  - **Victims** emotional problems
  - **Bullies** conduct problems

Wolke et al. 2013

McDougall & Vaillancourt 2015
Bullying/Peer Victimization

• Complex
School Bullying and Youth Violence

Causes or Consequences of Psychopathologic Behavior?

Young Shin Kim, MD, MS, MPH, PhD; Bennett L. Leventhal, MD; Yun-Joo Koh, PhD; Alan Hubbard, PhD; W. Thomas Boyce, MD
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- Unique
Bullying/Peer Victimization

- Maltreatment predicts many bad outcomes

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Adult mental health consequences of peer bullying and maltreatment in childhood: two cohorts in two countries

Suzet Tanya Lereya, William E Copeland, E Jane Costello, Dieter Wolke

Lancet Psychiatry 2015

- Unique
Bullying/Peer Victimization

- **Maltreatment predicts many bad outcomes**

**Adult mental health consequences of peer bullying and maltreatment in childhood: two cohorts in two countries**

- **Unique social context?**
- **Temporal proximity?**
- **Specificity in abuse types?**

Suzet Tanya Lereya, William E Copeland, E Jane Costello, Dieter Wolke

*Lancet Psychiatry 2015*
Outline

- Scope of Problem
- Genetics
- Peripheral Biological Indices
- Brain Structure & Function
Genetics

Ball et al. 2008
• **Not all studies are consistent** (Brendgen et al. 2008)

• **Twin studies of risk and of psychopathology**

• **Effects on stress response?** (Ouellet-Morin et al. 2011)
Molecular Genetics

- *Candidate Genes*
- *Telomere shortening*
Molecular Genetics

- Candidate Genes
- Telomere shortening
Genetic influences

Environmental influences

Domains: Brain-Behavior Relationships
Domains: Brain-Behavior Relationships

- Genetic influences
  - Acute Threat
  - Potential Threat
  - Response to Loss
  - Cognitive Control

- Cognitive Systems Domain

- Environmental influences

- Research Domains & Constructs
  - Negative Valence Domain

Genetic influences

Circuit Function

Amygdala - Prefrontal Cortex (PFC)

PFC-Basal Ganglia

Research Domains & Constructs

Acute Threat

Potential Threat

Response to Loss

Cognitive Control

Environmental influences

Domains: Brain-Behavior Relationships
Phenotypes

Research Domains & Constructs

Circuit Function

Amygdala - Prefrontal Cortex (PFC)

PFC-Basal Ganglia

Genetic influences

Environmental influences

Acute Threat

Potential Threat

Response to Loss

Cognitive Control

Symptoms

Behavior in Lab

Cognitive Ability

Hormones

Autonomics

Cytokines

Brain Imaging

Domains: Brain-Behavior Relationships
Outline

• Scope of Problem

• Genetics

• Peripheral Biological Indices

• Brain Structure & Function
Peripheral Biological Indices

• Range of Measures
  - Hormones
  - Autonomics
  - Inflammation
Peripheral Biological Indices

• Range of Measures

- Hormones
- Autonomics
- Inflammation

Cortisol

Vaillancourt et al. 2008

See also Hamilton et al. 2008; Hansen et al. 2006; Kliwer 2006; Knack et al. 2011; Ouellet-Morin et al. 2011a,b; see Miller et al. 2007 for meta-analysis with stress
Peripheral Biological Indices

- Range of Measures

- **Hormones**
- **Autonomics**
- **Inflammation**

**Cortisol**

![Graph showing cortisol levels for boys and girls over different days of the week.](Vaillancourt%20et%20al.%202008)

**C-Reactive Protein**

![Bar chart showing CRP levels for different groups: Neither, Pure bullies, Pure victims, Bully-Victims.](Copeland%20et%20al.%202014;%20Takizawa%20et%20al.%202015)
Peripheral Biological Indices

• Range of Measures
• Psychopathology
• Advantages and Disadvantages

Comparison with data on anxiety, conduct problems

- Hormones
- Autonomics
- Inflammation
Outline

• Scope of Problem
• Genetics
• Peripheral Biological Indices
• Brain Structure & Function
Brain Structure and Function

- Few studies of bullying
- Data in maltreatment
- Data in conduct disorder
Brain Structure and Function

• Brain Structure

• ROI-Based
• VBM
• DTI
Brain Structure and Function

• Brain Structure

Teicher et al. 2010

Peer verbal abuse and reduced mean diffusivity

• ROI-Based
• VBM
• DTI
Brain Structure and Function

- Brain Structure
  - ROI-Based
  - VBM
  - DTI

- Data in other stressors (De Bellis; Gee; Herringa; Holz; Pollak)

- Findings inconsistent

- Data in anxiety, conduct disorder
Brain Structure and Function

- Brain Function
  - ERP
  - rsfMRI
  - fMRI
Brain Structure and Function

• Brain Function

Intrinsic functional connectivity of the central nucleus (Ce) of the amygdala in young monkeys

A. Method overview

B. Regions with significant functional connectivity

Birn et al. 2014
Brain Structure and Function

- Brain Function

Intrinsic functional connectivity of the central nucleus (Ce) of the amygdala in young monkeys

A. Method overview

B. Regions with significant functional connectivity

- ERP
- rsfMRI
- fMRI

Childhood Trauma

Birn et al. 2014
Thompson et al. 2015
Brain Structure and Function

- ERP
- rsfMRI
- fMRI

Childhood Trauma

Marusak et al. 2015
Brain Structure and Function

- ERP
- rsfMRI
- fMRI

Childhood Trauma

Marusak et al. 2015
Brain Structure and Function

- ERP
- rsfMRI
- fMRI

Childhood Trauma
Marusak et al. 2015

Childhood Abuse
Lim et al. 2015

Peer Victimization
Casement et al. 2014
Brain Structure and Function

- ERP
- rsfMRI
- fMRI
Brain Structure and Function

- ERP
- rsfMgRI
- fMRI

Lim et al. 2015

Chronic Rejection

Early-life Stress

Puetz et al. 2015
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