




**Bullying Gets Under Your Skin:  
Effects of Bullying on Children and  
Youth**

April 27<sup>th</sup>, 2015

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## Presenter



Tracy Vaillancourt, Ph.D.

## Bullying Gets Under Your Skin: Health Effects of Bullying on Children and Youth



Tracy Vaillancourt, Ph.D.  
Professor and Canada Research Chair, Children's Mental Health and Violence Prevention  
Counselling, Faculty of Education  
School of Psychology, Faculty of Social Sciences  
University of Ottawa



## Learning Objectives

Examine...

- 1 link b/w bullying and mental health
- 2 temporal sequence
- 3 heterogeneity in MH outcomes
  - considering genetic, neurophysiological, and neuroendocrine evidence

Vaillancourt et al. (2010a, 2010b, 2013, 2015) suggest that understanding biological underpinnings of peer relations helps legitimize the plight of peer-abused children and youth

## Scope of the Problem— MH

- 1 15-20% of children and youth have serious mental health (MH) problems
- 2 50-75% of adult MH disorders began in childhood (before 15 years of age)
  - Kim-Cohen et al., 2003; Kessler et al., 2001; 2007; Weisz, 1998
- 3 MH problems in childhood and adolescence are the leading cause of health-related burden (UNICEF, 2008)
  - And, according to WHO (2012), depression is the leading cause of disability worldwide.
- 4 Most children with MH problems do not receive services and if they do, the services are often not evidence-based
  - Evidence-Practice Gap

**Mortality in Mental Disorders and Global Disease Burden Implications: A Systematic Review and Meta-analysis**

**JAMA Psychiatry**

estimate that 14.3% of deaths worldwide, or approximately 8 million deaths each year, are attributable to mental disorders.

**Abstract** Despite the global implications of understanding disease mortality among people with mental disorders and potential differences in mortality risk by type of death, diagnosis, and study characteristics...

**Objective** To conduct a systematic review and meta-analysis of mortality among people with mental disorders and potential differences in mortality risk by type of death, diagnosis, and study characteristics...

**Design** Systematic review and meta-analysis of cohort studies, case-control studies, and cross-sectional studies published between 1980 and 2015. The search strategy included Medline, Embase, PsycInfo, and Scopus. Search terms included mental disorders, mortality, and global disease burden. The meta-analysis was conducted using random-effects models.

**Results** In all, 10,000 studies were included in the meta-analysis. The overall mortality rate among people with mental disorders was 14.3% (95% CI, 13.2-15.4). Of these, 10.0% were attributable to natural causes, 4.3% to accidents, and 5.7% to suicide. The overall mortality rate among people with mental disorders was significantly higher than that of the general population (P < .001).

**Conclusions** People with mental disorders have a significantly higher mortality rate than the general population. The overall mortality rate among people with mental disorders was 14.3%, or approximately 8 million deaths each year, are attributable to mental disorders.

Call for action...

⬇️ bullying = ⬇️ MH problems

bullying ➡️ MH problems

**What is bullying?**

- A person is being bullied if he or she is exposed repeatedly and over time, to negative actions on the part of one or more persons.
  - Three Criteria:
    - repeated over time
    - imbalance of power
    - intentionality
- Systematic abuse of power.

**Scope of the Problem— Bullying**

- Prevalence rate
  - ~ 30% are bullied occasionally
  - ~ 7-10% are bullied **on a daily basis**

Source: Vaillancourt et al., 2010a, 2010b

Country	% of children aged 11, 12 and 13 who report being bullied at school at least once in the past 12 months of school
Italy	~55
Sweden	~45
Spain	~40
Czech Republic	~35
United Kingdom	~30
Denmark	~25
Belgium	~20
Netherlands	~15
Norway	~10
Poland	~8
Greece	~7
United States	~6
France	~5
Germany	~4
Luxembourg	~3
Slovenia	~2
Portugal	~1
Finland	~1
Latvia	~1
Lithuania	~1

Source: UNICEF Innocenti Report Card 11, 2013

**1 Link b/w bullying and MH**

- MH profile of victims
- MH profile of bullies

**Long term consequences**

- academic difficulties
- school truancy/avoidance
- increased absenteeism
- somatic complaints
- stress-related illness
- physical health problems
- low self-esteem
- depression
- social withdrawal/isolation
- social anxiety
- loneliness
- suicide
- aggressive behaviour

see review by McDougall & Vaillancourt, 2015

Article

### Adult Health Outcomes of Childhood Bullying Victimization: Evidence From a Five-Decade Longitudinal British Birth Cohort

Ryu Takizawa, M.D., Ph.D.  
Barbara Maughan, Ph.D.  
Louise Arseneault, Ph.D.

**Objective:** The authors examined middle outcomes of childhood bullying victimization. **Method:** Data were from the British National Child Development Study, a 50 year prospective cohort of births in 1 week in 1958. The authors conducted ordinal logistic and linear regressions on data from 2,771 participants whose parents reported bullying exposure at ages 7 and 11 years, and who participated in follow-up assessments between ages 23 and 50 years. Outcomes included suicidality and diagnoses of depression, anxiety disorders, and alcohol dependence at age 45; psychological distress and general health at ages 23 and 50; and cognitive functioning, socio-economic status, social relationships, and well-being at age 50. **Results:** Participants who were bullied in childhood had increased levels of psychological distress at ages 23 and 50. Victims of frequent bullying had higher rates of depression (odds ratio=1.95, 95% CI=1.27-2.99, anxiety disorder (odds ratio=1.65, 95% CI=1.25-2.18, and suicidality (odds ratio=2.21, 95% CI=1.47-3.31) than their nonvictimized peers. The effects were similar to those of being placed in public or substitute care and an index of multiple childhood adversities, and the effects remained significant after controlling for known correlates of bullying victimization. Childhood bullying victimization was associated with a lack of social relationships, economic hardship, and poor perceived quality of life at age 50. **Conclusions:** Children who are bullied—and especially those who are frequently bullied—continue to be at risk for a wide range of poor social, health, and economic outcomes nearly four decades after exposure. Interventions need to reduce bullying exposure in childhood and minimize long-term effects on victims' well-being; such interventions should cast light on causal processes.

*Am J Psychiatry Takizawa et al. AIA 1-8*

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## 2 Temporal Sequence

- Do children and youth become unwell as a consequence of poor treatment?

OR

- Are children and youth bullied because they are unwell to begin with?

– Bullied → poor MH?  
– Poor MH → bullied → poorer MH?

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## Internalizing Problems

- Peer victimization linked to internalizing problems in ensuing years
  - Arseneault et al., 2006; Goodman, Stormshak & Dishion, 2001; Hanish & Guerra, 2002; Hodges, Boivin, Vitaro, & Bukowski, 1999; Hodges & Perry, 1999; Kumpulainen & Rasanen, 2000; Schwartz, Gorman, Nakamoto, & Toblin, 2005; Snyder et al., 2003; Sweeting, Younger, West & Der, 2006; Troop-Gordon & Ladd, 2005; Vaillancourt et al., 2011; Zwierzyńska, Wolke, & Lereya, 2012;
  - see also meta-analyses by Reijntjes, Kamphuis, Prinzie, & Telch, 2010; Tiofi, Farrington, Losel, & Loeber, 2011

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## Do the victims of school bullies tend to become depressed later in life? *Yes*

### A systematic review and meta-analysis of longitudinal studies

Maria M. Tiofi, David P. Farrington, Friedrich Lösel and Rolf Loeber

**Abstract**  
**Purpose:** The purpose of this paper is to investigate the extent to which bullying victimization in school predicts depression in later life and whether the relation holds after controlling for other major childhood risk factors.  
**Design/methodology/approach:** As no previous systematic review has been conducted on this topic, other studies are based on both published and unpublished studies; original investigators of all studies have conducted specific analyses for the authors' review.  
**Findings:** The probability of being depressed up to 36 years later (mean follow-up period of 8.9 years) was much higher for children who were bullied at school than for non-bullied students (odds ratio (OR) = 1.88, 95% per cent CI: 1.71-2.03). Bullying victimization was a significant risk factor for later depression even after controlling for up to 20 (mean number of six correlated major childhood risk factors (OR = 1.78, 95% per cent CI: 1.54-1.87). Effect sizes were similar when the follow-up period was longer and larger the younger the child was when exposed to bullying. Finally, the summary effect size was not significantly related to the number of risk factors controlled for.  
**Originality/value:** Although causal inferences are tentative, the overall results presented in this paper indicate that bullying victimization is a major childhood risk factor that uniquely contributes to later depression. High quality effective anti-bullying programmes could be viewed as an early form of public health promotion.  
**Keywords:** Bullying, Schools, Adults, Depression  
**Paper type:** Research paper

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## Externalizing Problems

- Peer victimization linked to externalizing problems in ensuing years
  - Barker, Arseneault, Brendgen, & Maughan 2008; Hanish & Guerra, 2002; Ladd & Troop-Gordon, 2003; Smith, Talamelli, Cowie, Naylor, & Chauhan, 2004; Yeung & Leadbeater, 2010; see also meta-analysis by Reijntjes et al., 2011



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## Symptom Driven Pathway

- Meta-analytic work supports observation...
  - internalizing challenges can also antecede peer victimization although the reverse direction is stronger
    - Reijntjes et al. 2010
  - externalizing symptoms are sometimes observed to precede peer victimization
    - Reijntjes et al., 2011

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J Abnorm Child Psychol  
DOI 10.1007/s10802-013-9783-5

**Longitudinal Links Between Childhood Peer Victimization, Internalizing and Externalizing Problems, and Academic Functioning: Developmental Cascades**

Tracy Vaillancourt · Heather L. Britain · Patricia McDougall · Eric Duke

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## Academic Functioning

- Knowledge is more limited and associations less straightforward
  - pathways are often indirect or are not found
    - Beran, 2008; Hanish & Guerra, 2002; Kochenderfer & Ladd, 1996
  - some longitudinal studies show that victimized children fare less well academically and avoid school more over time
    - Buhs et al., 2006; Gastic, 2008; Kochenderfer & Ladd, 1996; Nansel, Haynie, & Simons-Morton, 2003; Schwartz et al., 2005

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## MH profile of children who bully

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## Bullying and Psychiatric Diagnosis

Diagnosis	Bullies (%)	Bully-victims (%)	Victims (%)	Controls (%)
Anxiety	5	5	8	2
Depression	12	18	10	5
Specific fears	2	2	3	1
ODD/CD	12	22	8	3
ADHD	28	18	15	6
Stigmatization	8	2	2	1
Other	4	4	5	3

Kumpulainen, K., Rasanen, E., & Puura, K. (2001)

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Research Article

**Impact of Bullying in Childhood on Adult Health, Wealth, Crime, and Social Outcomes**

Dieter Wolke<sup>1</sup>, William E. Copeland<sup>2</sup>, Adrian Angold<sup>2</sup>, and E. Jane Costello<sup>2</sup>

<sup>1</sup>Department of Psychology and Division of Mental Health and Wellbeing, University of Warwick, and <sup>2</sup>Department of Psychiatry and Behavioral Sciences, Duke University Medical Center

**Abstract**  
Bullying is a serious problem for schools, parents, and public-policy-makers alike. Bullying creates risks of health and social problems in childhood, but it is unclear if such risks extend into adulthood. A large cohort of children was assessed for bullying involvement in childhood and then followed up in young adulthood in an assessment of health, risky or illegal behavior, wealth, and social relationships. Victims of childhood bullying, including those that bullied others (bully-victims), were at increased risk of poor health, wealth, and social-relationship outcomes in adulthood even after we controlled for family hardship and childhood psychiatric disorders. In contrast, pure bullies were not at increased risk of poor outcomes in adulthood once other family and childhood risk factors were taken into account. Being bullied is not a harmless rite of passage but throws a long shadow over affected people's lives. Interventions in childhood are likely to reduce long-term health and social costs.

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But when controlling for family hardship and childhood psychiatric disorders:

- Victims & bully-victims at risk
  - poor health, wealth, & social-relationship outcomes in adulthood
- Bullies were not at risk for any of these variables.

Fig. 2. Associations between childhood role in bullying and young-adult standardized outcome scales (unadjusted for childhood family hardships and childhood psychiatric problems). Across all domains, negative scores indicate more problems than the mean for the total sample, and positive scores indicate fewer problems. Asterisks indicate significant differences from the not-involved-in-bullying group ( $p < .05$ ).

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### Bullying Is Power: Implications for School-Based Intervention Strategies

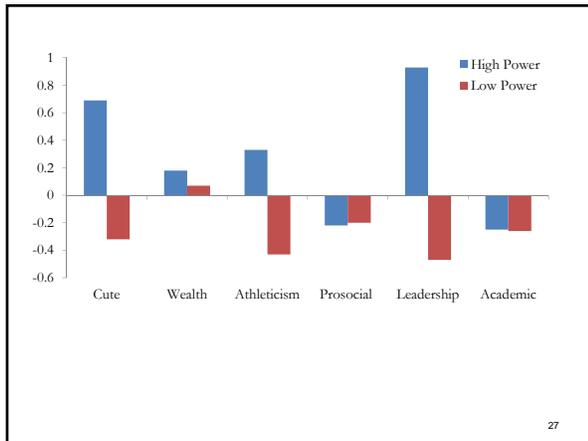
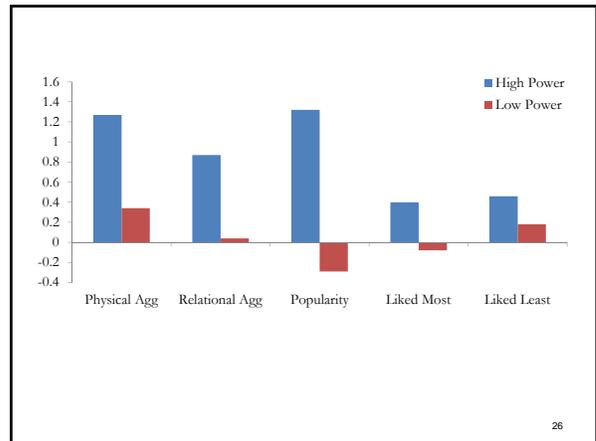
Tracy Vaillancourt  
Shelley Hymel  
Patricia McDougall

Much of what is known about bullies and bullying behavior comes from Olweus's (1973, 1978, 1993, 1996) large-scale studies of Scandinavian children in which he distinguished bullies from noninvolved students or victims in terms of their positive views of violence and of themselves (high rather than low self-esteem), their impulsivity and physical strength, and their lack of insecurity, anxiety and empathy for victims. More recent studies have focused on the mental health functioning of children identified as bullies. Like victims, bullies are at risk for internalizing difficulties including depression, suicidal ideation (Kaltiala-Heino, Rimpela, Marttunen, Rimpela, & Rantanen, 1999), and loneliness (Forero & McLellan, 1999), and like aggressive children, bullies are at risk for externalizing disorders (Kumpulainen et al., 1998), delinquency and criminality (Olweus, 1993), as well as poor academic achievement, smoking, and substance abuse (Nansel et al., 2001). These findings are consistent with traditional, intuitive notions of bullies as poorly accepted, marginal members of the peer group who are psychologically unfit. We question this stereotypic portrayal.

This chapter was adapted from "Bullying Is Power: Implications for School-Based Intervention Strategies" by Tracy Vaillancourt, Shelley Hymel, and Patricia McDougall, *Journal of Applied School Psychology*, 19(2), pp. 157-176.

Bullying, Victimization, and Peer Harassment  
Published by The Haworth Press, Inc., 2007. All rights reserved.  
doi:10.1300/S108\_18 317

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### Why these divergent pathways?

**Victims**



**Bullies**



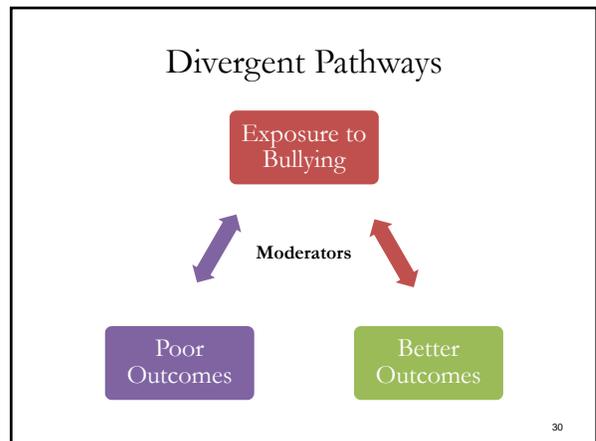
- Interferes with their fundamental need to belong.
- Does not interfere with their fundamental need to belong.
- Linked to high status.

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### 3 Heterogeneity in MH outcomes

- Why is it that some children and youth seem to be so adversely affected by bullying while others seem to cope better?

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## Moderators



- Environmental characteristics
  - Youth with better home environments fare better when bullied than youth with poorer home environments
    - Baldry & Farrington, 2005; Flouri & Buchanan, 2002
  - In classrooms where victimization emerges as central, the negative impact of victimization on mental health outcomes is greater
    - Huitsing et al., 2012

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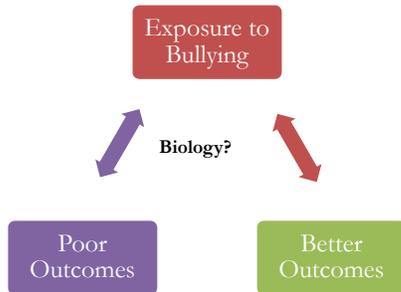
## Moderators cont.



- Personal Characteristics
  - Peer victimization at age 8 was associated with suicide attempts before age 25 for girls/women but not for boys/men (controlling for conduct and depressive symptoms).
    - Klomek et al., 2009
  - Internalizing problems persisted even after the bullying had stopped for girls, but not for boys.
    - Rueger et al., 2011

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## Divergent Pathways



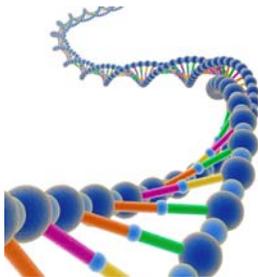
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## Not Drama Queens!



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## Genetic Evidence



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## Influence of Life Stress on Depression: Moderation by a Polymorphism in the 5-HTT Gene

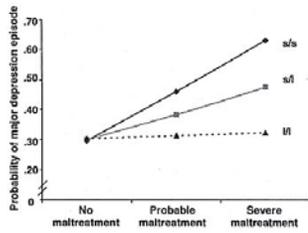
Avshalom Caspi,<sup>1,2</sup> Karen Sugden,<sup>1</sup> Terrie E. Moffitt,<sup>1,2\*</sup>  
 Alan Taylor,<sup>1</sup> Ian W. Craig,<sup>1</sup> HonaLee Harrington,<sup>2</sup>  
 Joseph McClay,<sup>1</sup> Jonathan Mill,<sup>1</sup> Judy Martin,<sup>3</sup>  
 Antony Braithwaite,<sup>4</sup> Richie Poulton<sup>3</sup>

In a prospective-longitudinal study of a representative birth cohort, we tested why stressful experiences lead to depression in some people but not in others. A functional polymorphism in the promoter region of the serotonin transporter (5-HTT) gene was found to moderate the influence of stressful life events on depression. Individuals with one or two copies of the short allele of the 5-HTT promoter polymorphism exhibited more depressive symptoms, diagnosable depression, and suicidality in relation to stressful life events than individuals homozygous for the long allele. This epidemiological study thus provides evidence of a gene-by-environment interaction, in which an individual's response to environmental insults is moderated by his or her genetic makeup.

18 JULY 2003 VOL 301 SCIENCE www.sciencemag.org

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### Serotonin Gene, Experience, and Depression: Age 26



\*Allele= 1 of 2 or more forms of a gene

### Replicated with bullied youth

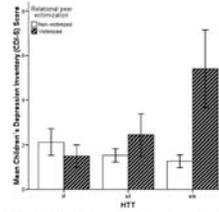


Figure 1 Depressive symptoms by genotype and relational peer victimization group. Note: s/l = heterozygous for long allele; s/s = heterozygous for short and long allele; l/l = homozygous for short allele; \*p < .05, \*\*p < .01

- Banny et al., 2013
  - Benjet et al., 2010
  - Iyer et al., 2013
  - Sugden et al., 2010
  - Kretschmer et al. 2014\*
- \*peer rejection predicting antisocial behaviour

### Other cGxE interactions

J Youth Adolescence  
DOI 10.1007/s10964-015-0282-4

EMPIRICAL RESEARCH

#### Peer Victimization and DRD4 Genotype Influence Problem Behaviors in Young Children

Lisabeth Fisher DLatta<sup>1</sup> · Kyle Bersted<sup>2</sup> · Sufna Gheyara John<sup>3</sup>

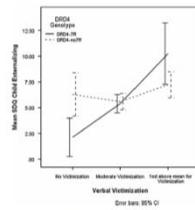


Fig. 1 Interaction of DRD4 and verbal victimization predicting to SDQ externalizing problem behaviors. Variables are plotted without transformation (see Table 1 for means and ranges). The slope for the DRD4 s/s group is significant (the slope for the DRD4 s/l/l group is not)

Sticks and stones may break my bones but words will never hurt me. SAYS WHO?



### UN World Report on Violence against Children (2006)

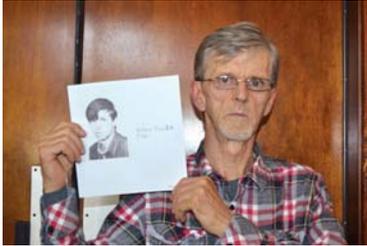
- “...persistent social acceptance of some types of violence against children...”
- “...corporal punishment and other forms of cruel or degrading punishment, bullying and sexual harassment, and a range of violent traditional practices may be perceived as normal, particularly when no lasting visible physical injury results.”

### Neurophysiological Evidence



Robin Tomlin Fag.

“I feel like, emotionally, they have been beating me with a stick for 42 years”



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- Studies show that people can relive and re-experience social pain more easily than physical pain and the emotions they feel are more intense and painful.
  - Chen, Williams, Fitness, Newton, 2008
- Physical pain is often short lived whereas social pain can last a life time.



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Sir Winston Churchill (1874-1965)

“Criticism may not be agreeable, but it is necessary. It fulfills the same function as pain in the human body. It calls attention to an unhealthy state of things”

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doi:10.1093/scan/mp007

SCAN (2009) 4, 143–157

### Neural correlates of social exclusion during adolescence: understanding the distress of peer rejection

Recent neuroimaging studies have shown that parts of the cortical physical pain network are also activated when a person is socially excluded

- Physical & social pain share similar neural structures
- Linked to evolution

was negatively related to self-reported distress. Findings unique to adolescents indicated that activity in the subgenual anterior cingulate cortex (subACC) related to greater distress, and that activity in the ventral striatum related to less distress and appeared to play a role in regulating activity in the subACC and other regions involved in emotional distress. Finally, adolescents with higher rejection sensitivity and interpersonal competence scores displayed greater neural evidence of emotional distress, and adolescents with higher interpersonal competence scores also displayed greater neural evidence of regulation, perhaps suggesting that adolescents who are vigilant regarding peer acceptance may be most sensitive to rejection experiences.

Keywords: peer rejection; adolescence; functional magnetic resonance imaging

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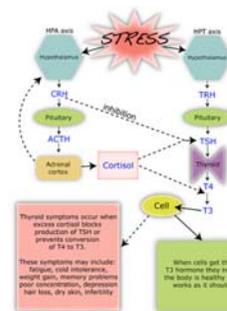
## Neural Alarm

- Rejection is differentiated in less than 500 ms by children
  - Using event-related potentials (ERPs) to study neural activity that occurs when a person is rejected

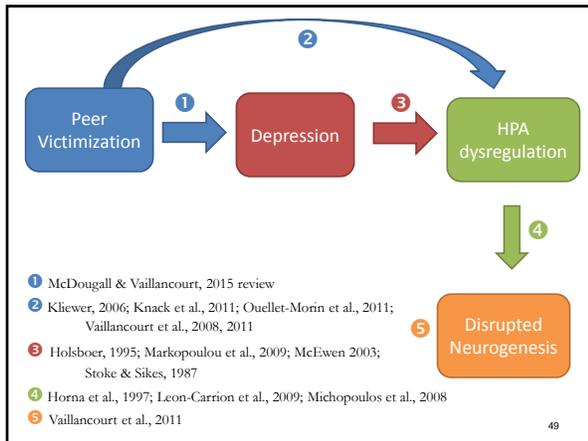
Crowley et al., 2010

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## Neuroendocrine Evidence



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Brain and Cognition  
 Journal homepage: www.elsevier.com/locate/bsc

Peer victimization, depressive symptoms, and high salivary cortisol predict poorer memory in children  
 Tracy Vaillancourt<sup>a,b,c,d</sup>, Eric Duku<sup>a,d</sup>, Suzanna Becker<sup>a</sup>, Louis A. Schmidt<sup>e</sup>, Jeffrey Nicol<sup>f</sup>, Cameron Muir<sup>g</sup>, Harriet MacMillan<sup>g,h</sup>

ABSTRACT  
 The positive relation of peer victimization, depressive symptoms, and salivary cortisol on memory in 140 children aged 12 to 16 years (71% were exposed using a longitudinal design in which data were collected on four occasions over a 3-year period. Results indicated that (1) peer victimization, depressive symptoms, and evening cortisol were related over time, (2) peer victimization and elevated symptoms of depression were concurrently linked at each time, (3) 13-year victimization predicted elevated levels of depression at 15 which in turn predicted lower cortisol levels at 15, and (4) controlling for salivary cortisol, 13-year victimization, depressive symptoms, and higher morning and evening cortisol levels uniquely predicted memory skills at 15. The data increased elevated cortisol, symptoms of depression, and poor memory are associated with published reports on depressed adults and related the findings to children exposed to peer victimization. These findings highlight that peer abuse is harmful and may impact children's long-term mental health and memory functioning.

A Discordant Monozygotic Twin Design Shows Blunted Cortisol Reactivity Among Bullied Children  
 Isabelle Ouellet-Morin, Ph.D., Andrea Danese, M.D., Ph.D., Lucy Bowes, Ph.D., Sania Shakoor, M.Sc., Antony Ambler, M.Sc., Carmine M. Pariante, M.D., M.Sc., Ph.D., Andrew S. Papadopoulos, Ph.D., Avshalom Caspi, Ph.D., Terrie E. Moffitt, Ph.D., Louise Arseneault, Ph.D.

Objective: Childhood adverse experiences are known to provoke persistent changes in stress.  
 “Results from this natural experiment provide support for a causal effect of adverse childhood experiences on the neuroendocrine response to stress”.

Environmental Risk (E-Risk) Longitudinal Twin Study, a nationally representative 1994-1995 cohort of families with twins. Results: Bullied and nonbullied MZ twins showed distinct patterns of cortisol secretion after the PST. Specifically, bullied twins exhibited a blunted cortisol response compared with their nonbullied MZ co-twins, who showed the expected increase. This difference in cortisol response to stress could not be attributed to children's genetic makeup, their familial environments, pre-existing and concomitant individual factors, or the perception of stress and emotional response to the PST. Conclusion: Results from this natural experiment provide support for a causal effect of adverse childhood experiences on the neuroendocrine response to stress. J. Am. Acad. Child Adolesc. Psychiatry, 2011;50(6):574-582. Key words: early-life stress, cortisol, HPA axis, discordant MZ twin design, bullying.

Childhood bullying involvement predicts low-grade systemic inflammation into adulthood  
 PNAS, 2014  
 William E. Copeland<sup>1</sup>, Dieter Wolke<sup>2</sup>, Suresh Tanya Lereya<sup>3</sup>, Lily Shanahan<sup>4</sup>, Carol Worthman<sup>5</sup>, and E. Jane Costello<sup>1</sup>

Bullying is a common childhood experience that involves repeated mistreatment by peers or authority over a 12-month period. Bullying has long-term social, psychological, and health consequences, whereas bullies display mental ill-effects. The aim of this study is to test how this adverse social experience is biologically embedded to affect short- or long-term levels of C-reactive protein (CRP), a marker of low-grade systemic inflammation. The prospective population-based Great Smoky Mountains Study (n = 1,405) with up to nine waves of data per subject, was used, covering childhood adolescence (ages 9-16) and young adulthood (ages 18 and 21). Structured interviews were used to assess bullying involvement and current occurrence at all childhood adolescent observation times. Blood spots were collected at each observation and assayed for CRP levels. During childhood and adolescence, the number of waves in which the child was bullied predicted increasing levels of CRP. Although CRP levels rise for all participants, those who had been bullied, being bullied predicted greater increases in CRP levels, whereas bullying others predicted lower increases in CRP compared with those controls in bullying. This pattern was robust, controlling for body mass index, substance use, physical and mental health status, and exposure to other childhood psychosocial adversities. A child's role in bullying may serve as either a risk or a protective factor for adult low-grade inflammation, independent of other factors. Inflammation is a physiological response that mediates the effects of both social adversity and substance on disease in health.

Fig. 2. Adjusted mean young adult CRP levels (milligrams per liter) based on childhood/adolescent bullying status. These values are adjusted for baseline CRP levels as well as other CRP-related covariates. All analyses used robust SEs to account for repeated observations.

Telomere

• Telomere--repetitive nucleotide sequence (TTAGGG) at the end of chromosomes which promotes “chromosomal stability and also regulates the cells’ cellular replicative lifespan”.  
 – Kiecolt-Glaser et al., 2011, p. 16

Telomere Erosion

- Linked to normal processes like aging and associated with
  - health behaviour e.g., smoking and obesity
  - diseases e.g., cancer, dementia, diabetes, and cardiovascular problems
- Shorter telomere length linked to psychological stress and mortality.

Vaillancourt et al., 2013 for review

Molecular Psychiatry (2012), 1–6  
© 2012 Macmillan Publishers Limited. All rights reserved 1228-4136/12  
www.nature.com/imp

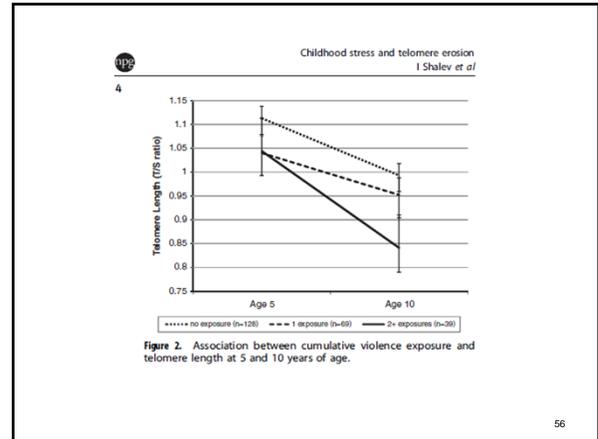
**ORIGINAL ARTICLE**  
**Exposure to violence during childhood is associated with telomere erosion from 5 to 10 years of age: a longitudinal study**  
 I Shalev<sup>1,2</sup>, TE Moffitt<sup>1,2,3,4</sup>, K Sugden<sup>1,2,3,4</sup>, B Williams<sup>1,2,3,4</sup>, RM Hoos<sup>1,2</sup>, A Danese<sup>5</sup>, J Mill<sup>6</sup>, L Arseneault<sup>6</sup> and A Caspi<sup>1,2,3,4</sup>

There is increasing interest in discovering mechanisms that mediate the effects of childhood stress on late-life disease morbidity and mortality. Previous studies have suggested one potential mechanism linking stress to cellular aging, disease and mortality in humans: telomere erosion. We examined telomere erosion in relation to children's exposure to violence, a salient early-life stressor, which has known long-term consequences for well-being and is a major public health and social welfare problem. In the first prospective longitudinal study with repeated telomere measurements in children while they experienced stress, we tested the hypothesis that childhood violence exposure would accelerate telomere erosion from age 5 to age 10 years. Violence was assessed as exposure to maternal domestic violence, frequent bullying victimization and physical maltreatment by an adult. Participants were 236 children (99% females; 42% with one or more violence exposures) recruited from the Environmental Risk Longitudinal Twin Study, a nationally representative 1994–1995 birth cohort. Each child's mean relative telomere length was measured simultaneously in baseline and follow-up DNA samples, using the quantitative PCR method for T/S ratio (the ratio of telomere repeat copy numbers to single-copy gene numbers). Compared with their counterparts, the children who experienced two or more kinds of violence exposure showed significantly more telomere erosion between age-5 baseline and age-10 follow-up measurements, even after adjusting for sex, socioeconomic status and body mass index ( $\beta = -0.052$ , s.e. = 0.021,  $P = 0.015$ ). This finding provides support for a mechanism linking cumulative childhood stress to telomere maintenance, observed already at a young age, with potential impact for life-long health.

Molecular Psychiatry advance online publication, 24 April 2012; doi:10.1038/mp.2012.32

**Keywords:** childhood stress; cumulative violence exposure; erosion; longitudinal; telomere length

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## Epigenetic Mechanisms

- DNA methylation is an epigenetic mechanism that...
  - “maintains gene activity or changes gene expression by activating or silencing the gene, resulting in the development of phenotypes that are time-dependent and are not determined by the DNA sequence at that locus”
  - Vaillancourt et al., 2013, p. 243-244

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- Epigenetic alterations are believed to function as a biological mechanism in which environmental signals are translated into “organismal molecular events”.
  - Bick et al., 2012; see also Vaillancourt et al., 2015
- Recent studies have shown that childhood adversity is linked to changes in DNA methylation which has an effect on later stress reactivity
  - see Vaillancourt et al., 2015 for a review

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Psychol Bull (2013) 139, 915–920. © Cambridge University Press 2012  
doi:10.1017/S0033291712001794

**ORIGINAL ARTICLE**  
**Increased serotonin transporter gene (*SERT*) DNA methylation is associated with bullying victimization and blunted cortisol response to stress in childhood: a longitudinal study of discordant monozygotic twins**  
 E Charlier-Martin<sup>1,2</sup>, C. C. Y. Wang<sup>1</sup>, A. Danese<sup>3</sup>, C. M. Pariante<sup>4</sup>, A. S. Papadopoulos<sup>5</sup>, J. Mill<sup>6</sup> and L. Arseneault<sup>6</sup>

- Found that...
  - ① higher DNA methylation of the serotonin transporter gene between ages 5 and 10 for bullied twins but not for non-bullied twins, and
  - ② this was associated with blunted cortisol response to stress.

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## What does this all mean?

- Experience of being bullied by peers likely becomes “biologically embedded in the physiology of the developing person”
- these invisible scars change a person’s capacity to deal with subsequent stressors
- and modify their health and learning trajectory.

Vaillancourt et al., 2013 & see also Brick et al., 2012

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- Today, we do not know if the biological scars can be reversed...
  - it seems prudent to fight the root cause directly
  - by encouraging policy makers and practitioners to prioritize the reduction of school bullying.



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Questions?

**Additional Resources**

- [Building Capacity to Reduce Bullying- IOM Workshop Summary](#)
- [StopBullying.gov website](#)
- [StopBullying.gov Blog](#)
- [CSN Bullying Prevention Resource Guide](#)

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**Save the Date**

Populations at Increased Risk for Bullying Victimization

May 28, 3:00-4:00 p.m. Eastern Time

Registration coming soon

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 National Injury and Violence Prevention Resource Center

**Thank You!**

Please complete this brief evaluation  
<https://www.surveymonkey.com/r/DPH5B2F>

**Contact Information**

Children's Safety Network  
 Education Development Center, Inc.  
 43 Foundry Ave, Waltham MA 02453  
[www.ChildrensSafetyNetwork.org](http://www.ChildrensSafetyNetwork.org)  
 1-617-618-2178

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