

The Neuroscience of Resilience: How Brain Development Affects Learning, Health and Social Outcomes Across the Life Span

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Resilience 1.0: The Myth of the “Invulnerable Child”

“... Invulnerable children who are brought up in traumatic and stressful surroundings become stress resistant – they thrive in spite of disadvantages.”

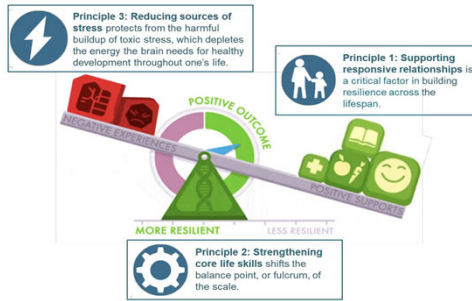
“... In a stressful environment, vulnerable children (“glass”) break down, moderately vulnerable children (“plastic”) incur some damage, but invulnerable children (“steel”) remain intact and even thrive on the troubles and turmoil in their world.”

Robinson and Fields, 1983, Social Work, 28(1)

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Resilience 2.0: An Outcome and a Dynamic Capacity that is Built Over Time

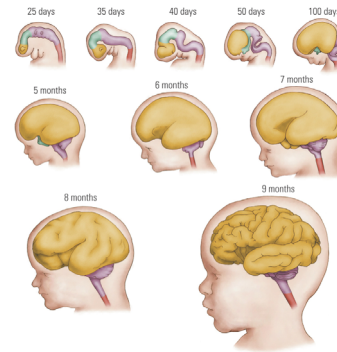
At the individual level, resilience is a product of our biology and our experiences, like a scale that can be tipped to one side or the other.



Source: Alberta Family Wellness Initiative, Palix Foundation

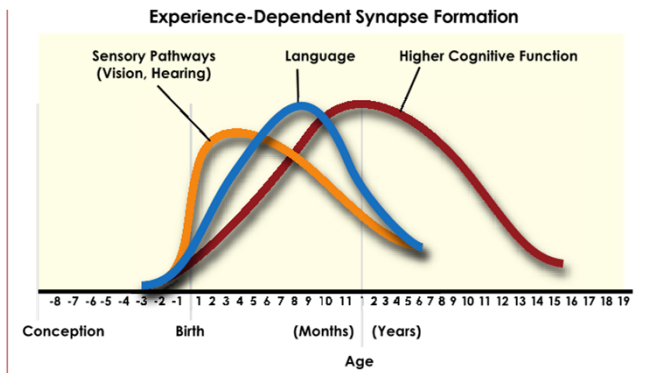
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Brain Development is a Long-Term Process



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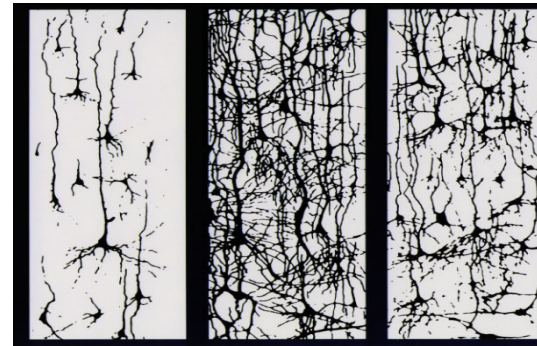
Neural Circuits are Wired in a Bottom-Up Sequence



Source: C.A. Nelson (2000)

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Experience-Based Pruning of Synapses During Childhood and Adolescence



Birth

3 years

14 years

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What Kind of Experiences are the *Most* Important?

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**“Serve and Return” Social Interactions With Adults
Build Cognitive, Social, and Emotional Skills
in Children**



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Executive Function is Like Air Traffic Control: Helps Us Navigate our World and Succeed in Life

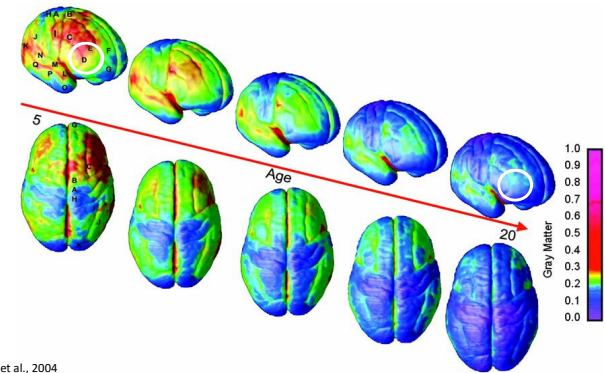


EF skill set is based on cognitive, social and emotional competencies:

- Working memory
- Delayed gratification/impulse control
- Cognitive flexibility
- Self-regulation
- Attention
- Planning and organization
- Perseverance
- Reasoning and evaluation
- Problem solving

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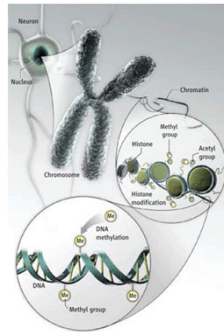
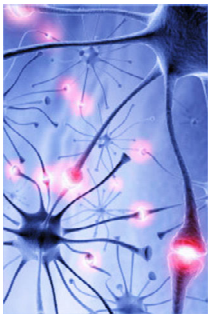
Brain Still Maturing Until Mid- to Late-Twenties: PFC Matures Last



Source: Gotlib, Giedd, et al., 2004

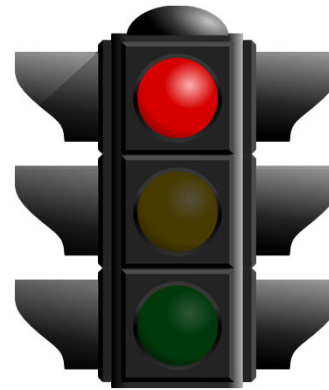
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Serve and Return Interactions Alter Gene Expression



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Stress Also Shapes Brain Architecture



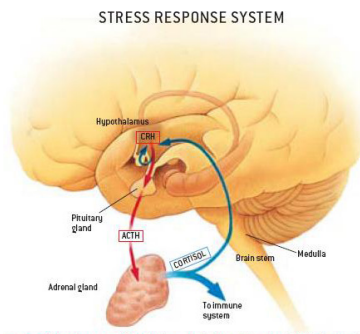
Toxic Stress: Prolonged activation of the stress response system in the absence of supportive adult relationships; e.g., abuse, neglect, family dysfunction.

Tolerable Stress: Serious but temporary activation of stress response, can damage brain architecture if not buffered by supportive adult relationships; e.g., death in the family.

Positive Stress: Brief activation of stress response system, required for healthy development; e.g., immunization, first day of school.

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Early Toxic Stress is Biologically Embedded and Affects Brain and Behaviour



Effect of Catecholamines (Adrenalin):

- Increased heart rate, blood pressure
- Decrease in non-essential functions (e.g., digestion, reproduction)
- Blood clotting
- Mobilization of glucose stores

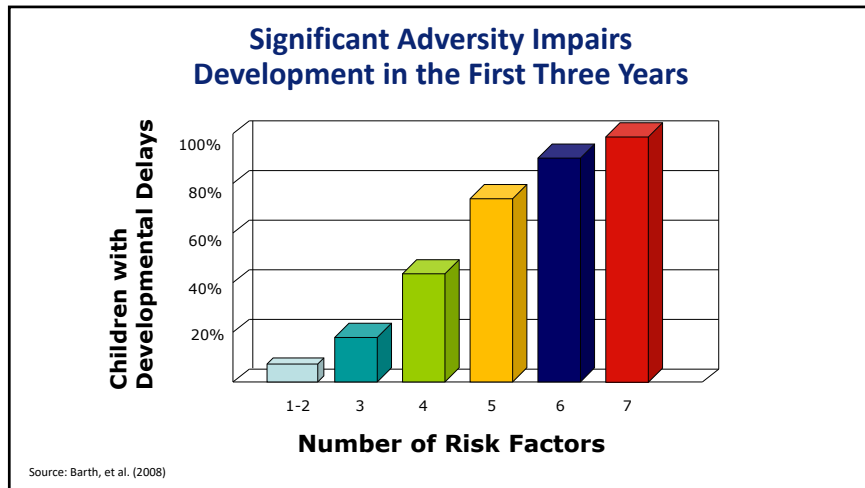
Effect of Glucocorticoids (Cortisol):

- Glucose metabolism
- Insulin production
- Immunosuppression and activation
- Negative feedback on HPA axis

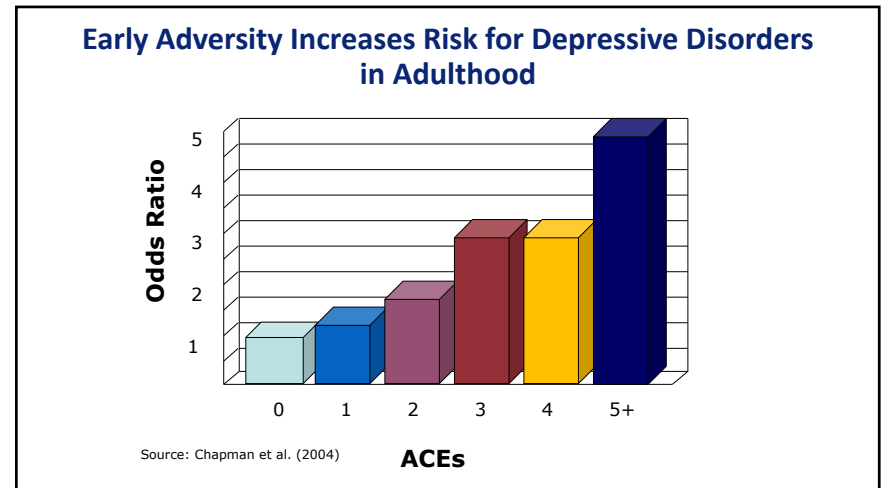
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Short and Long Term Outcomes Associated with Early Adversity

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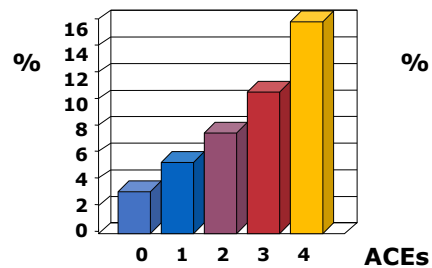
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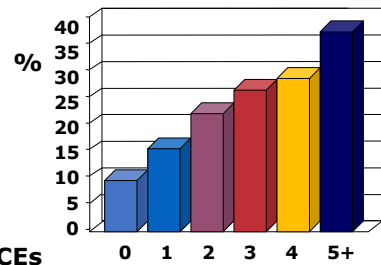
Early Adversity Increases Risk for Substance Use Disorders in Adulthood

Self-Report: Alcoholism



Source: Dube et al. (2002)

Self-Report: Illicit Drugs



Source: Dube et al. (2003)

Toxic Stress Affects Brain *and* Behaviour to Influence Outcomes Over the Life Span

Toxic stress undermines executive function, dysregulates the stress responses system, and increases risk for:

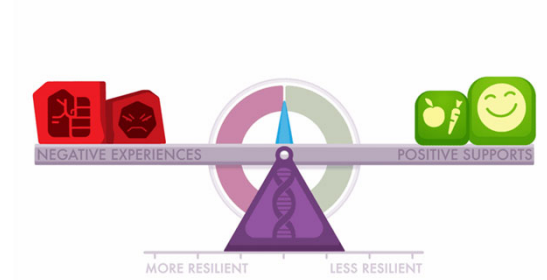
- Poor academic achievement
- Behavioural problems
- Addiction, mental illness, suicide
- Risky sexual behaviour
- Family violence
- Separation and divorce
- Unstable employment
- Homelessness
- Criminal behaviour
- Chronic disease – cardiovascular, metabolic, immune, chronic pain, memory loss, dementia
- Early death

Where Do We Go From Here?

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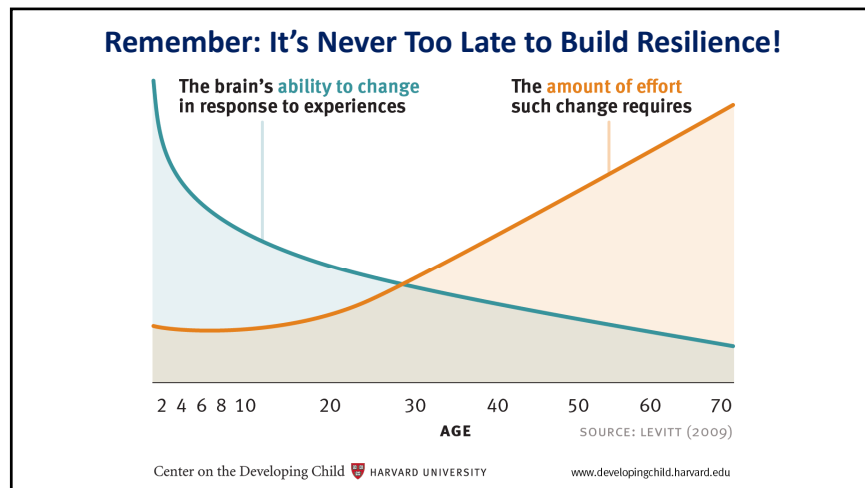
Positive Experiences and Supportive Relationships Build Resilience in Children AND Adults

The active ingredient in resilience building is the presence of stable, supportive relationships that scaffold coping skills and buffer the impact of toxic stress.



Source: Alberta Family Wellness Initiative, Palix Foundation

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- Lessons Learned from a Decade of Application:
Practice, Program, Organizational Change**
- Shifts mental models which are the necessary precursors of behaviour and practice change; reduces stigma
 - Creates understanding, engagement and motivation for change in clients; reduces self-blame
 - ACEs are important but so are strengths; don't forget to focus on all aspects of resilience
 - Sense-making is an active and deliberate process: make time for it
 - Align with organizational goals and culture
 - Build continuous evaluation into the process

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Lessons Learned from a Decade of Application: System Change

- Addressing complex social issues requires a system and/or multi-system approach
- Creates a common language and understanding of complex social issues across sectors
- Provides a foundation for developing common goals and collective action to address complex social issues
- Cultivating new change agents and champions for the knowledge across sectors increases impact

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Questions?

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