



# The Effect of Early Experiences on Brain Development, Learning, and Health and Wellness

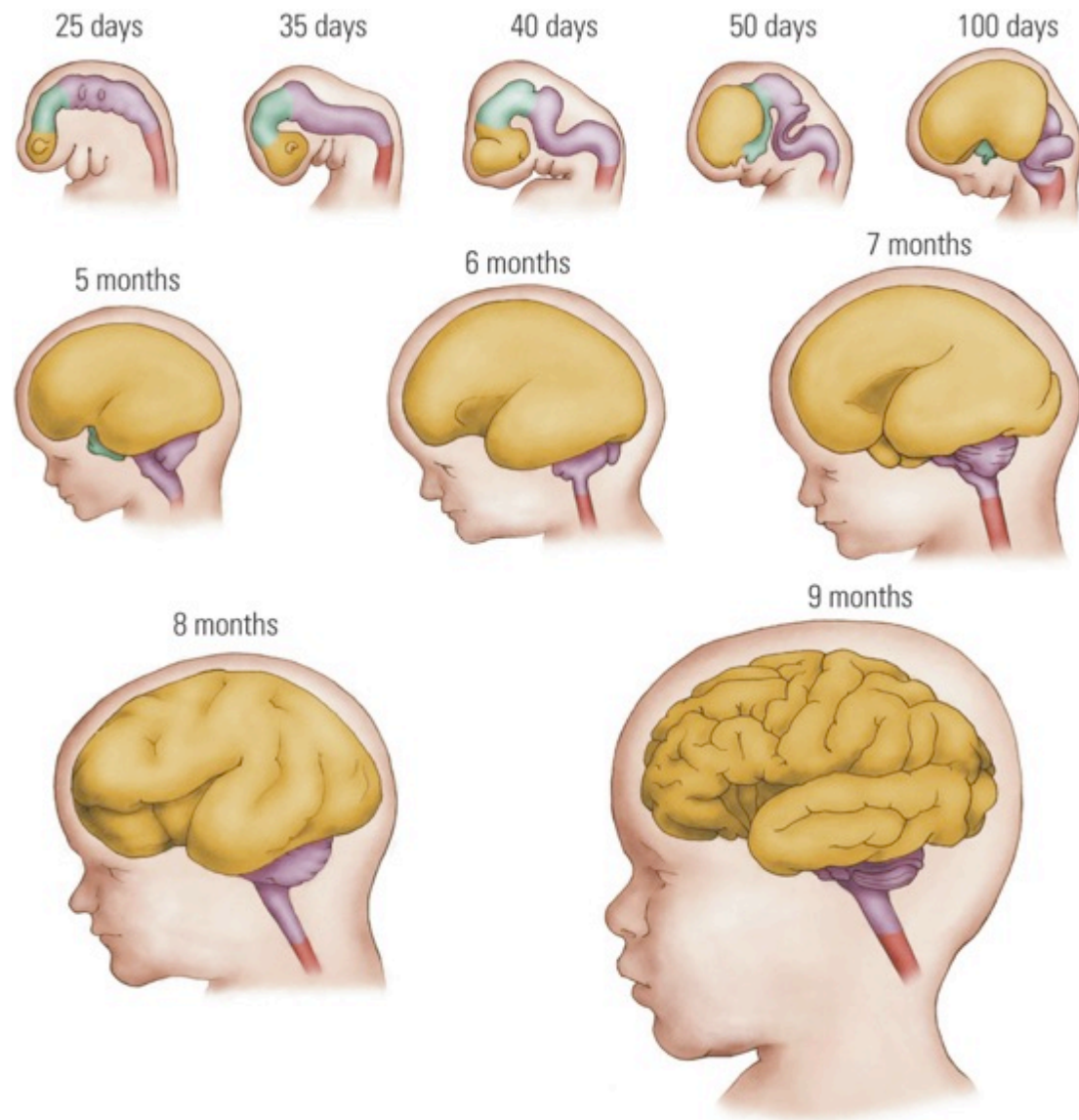
Skate Canada

May 24, 2018



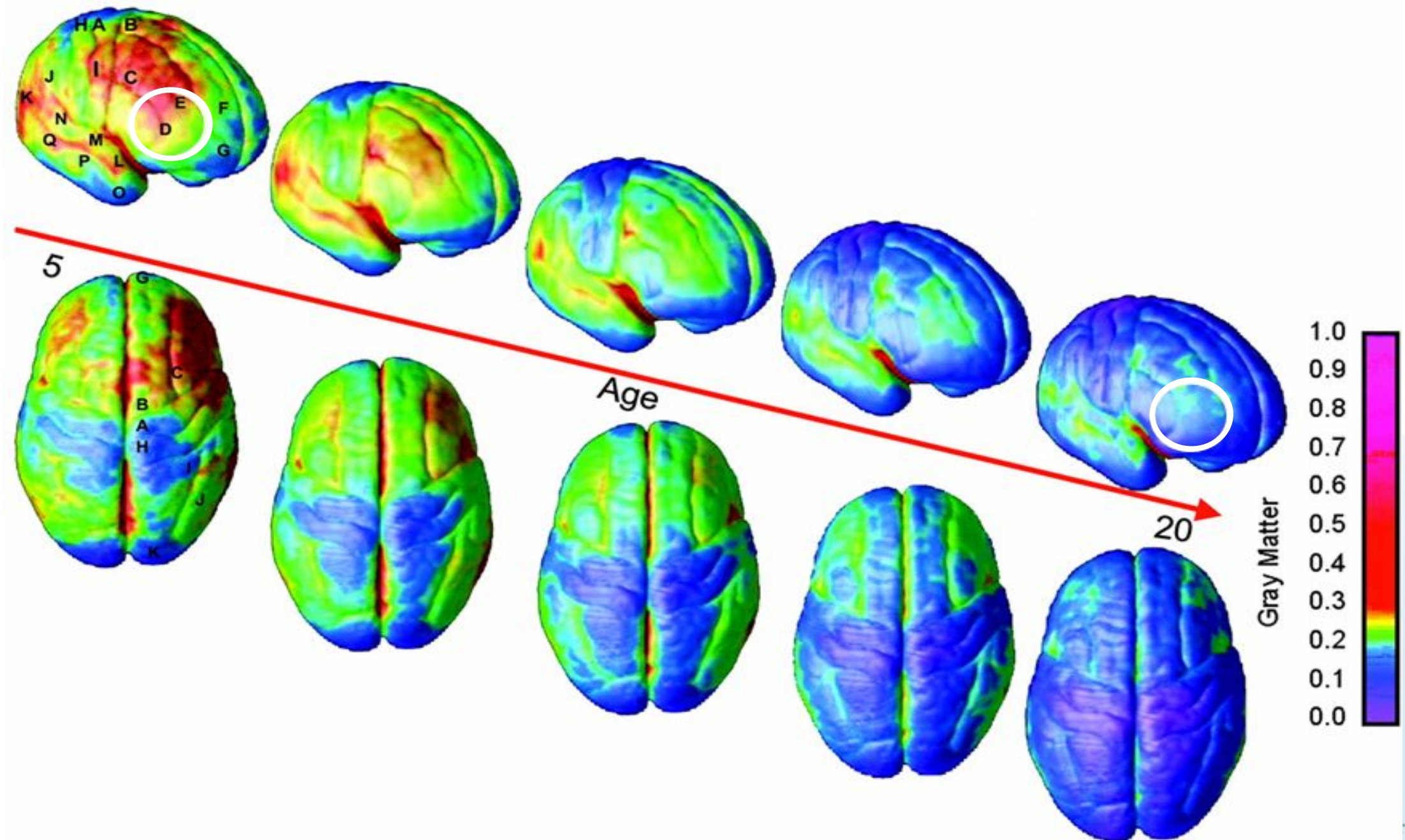


# Brain Development is a Long-term Process





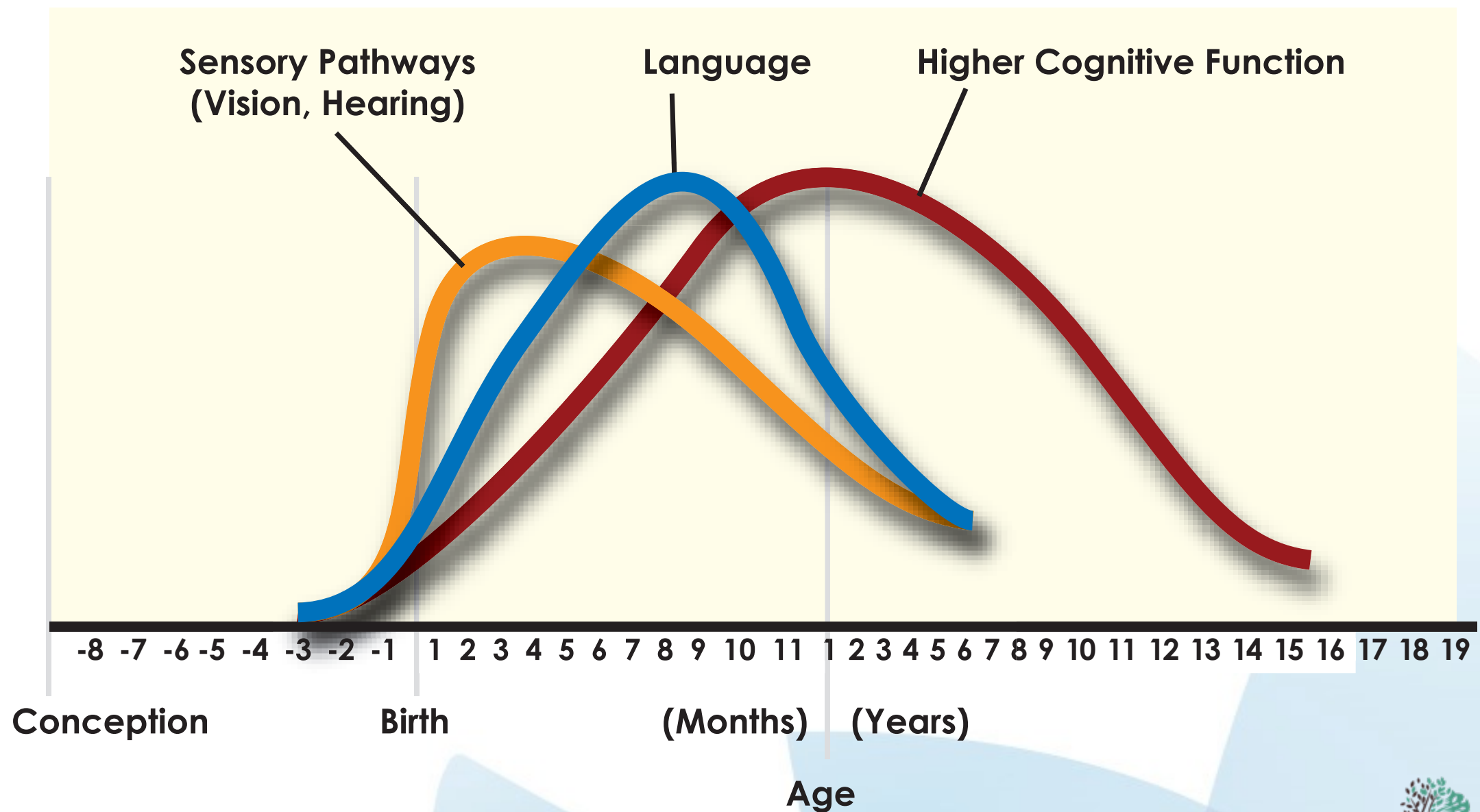
# Brain Still Maturing Until Late Twenties



Source: Gotlib, Giedd, et al., 2004

# Neural Circuits are Wired in a Bottom-Up Sequence

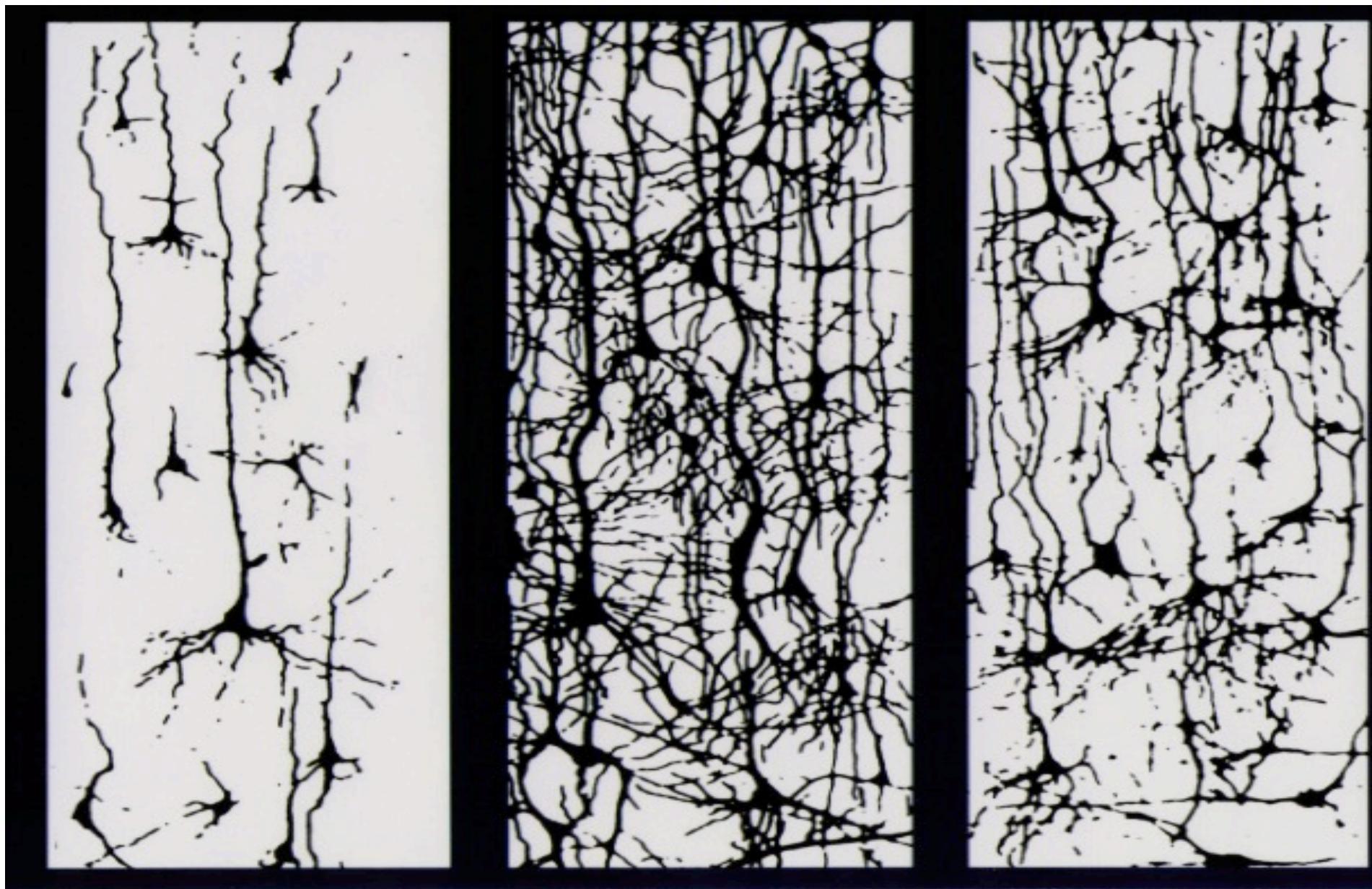
## Experience-Dependent Synapse Formation



Source: C.A. Nelson (2000)



# Experience-Based Pruning of Synapses During Childhood and Adolescence



**Birth**

**3 years**

**14 years**

# What Kind of Experiences Shape Development?



# Infants are Hard Wired for Social Interactions



Fig. 1. Sample photographs from videotape recordings of 2- to 3-week-old infants imitating (a) tongue protrusion, (b) mouth opening, and (c) lip protrusion demonstrated by an adult experimenter.

Figure 19.1 Fantz's face shapes



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





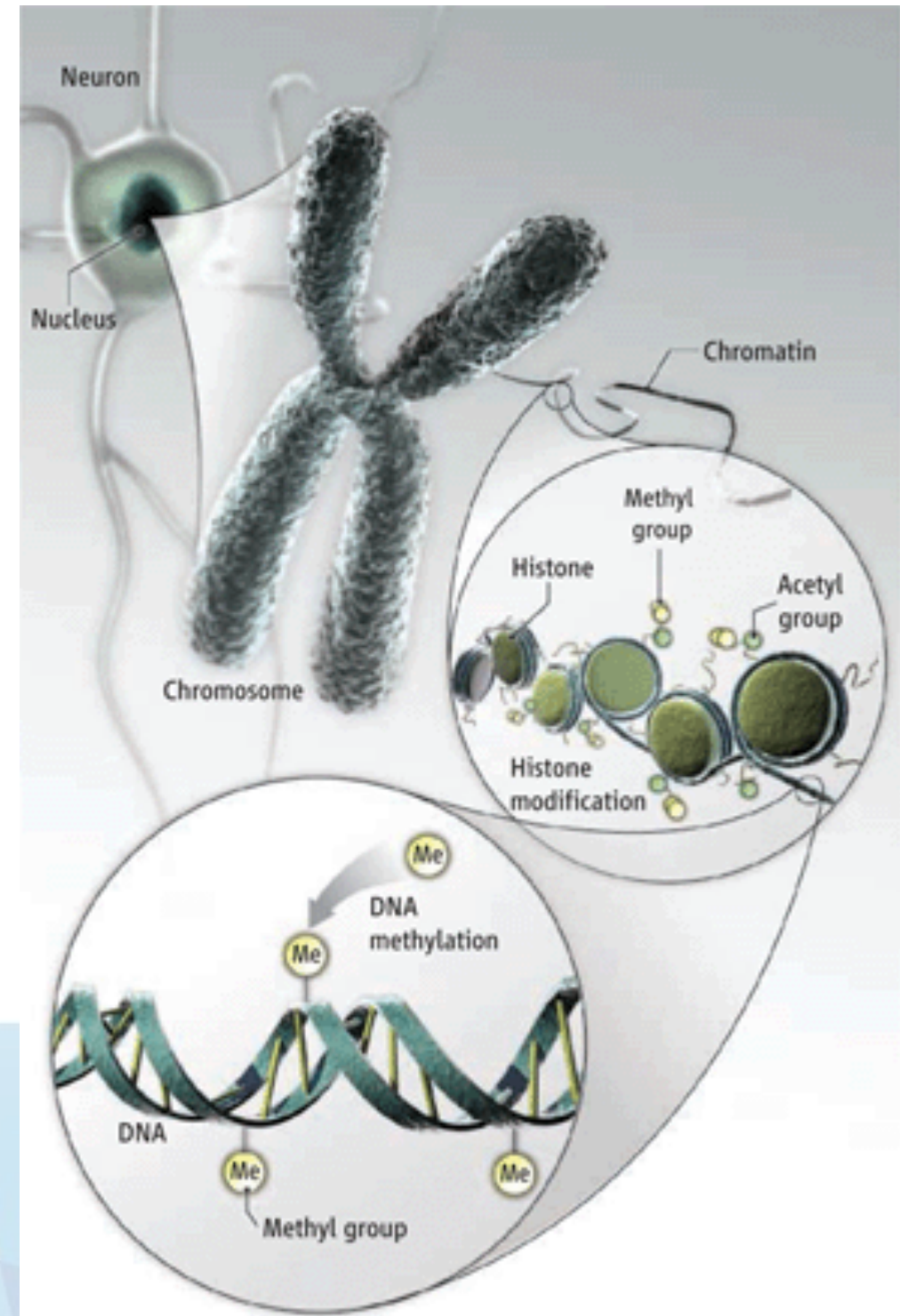
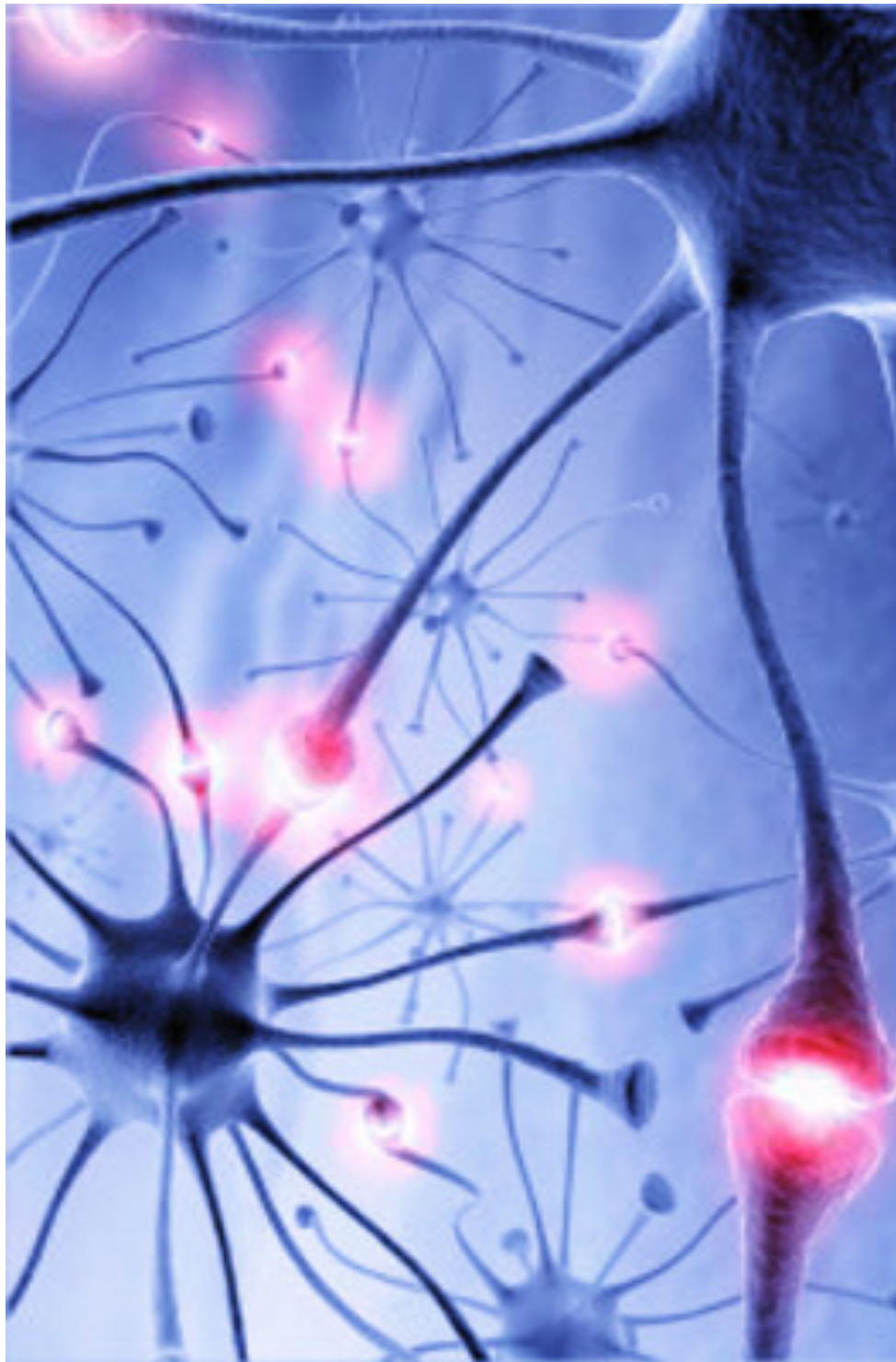
# Executive Function is Like Air Traffic Control: Helps Children Navigate Their World and Succeed in Life



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

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

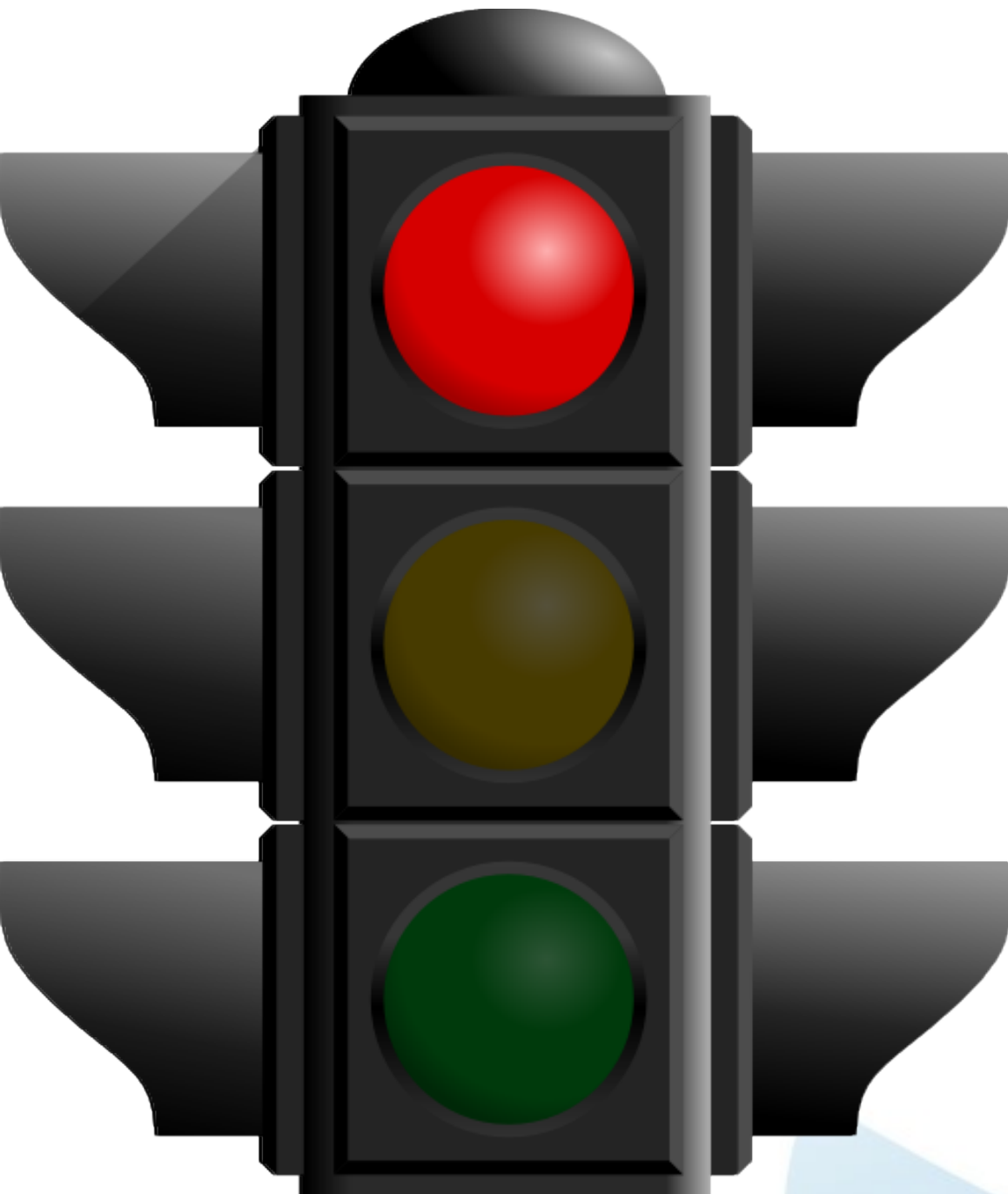
# Serve and Return Interactions Alter Neural Circuits and Gene Expression





# The Biology of Early Adversity

# 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, living with an addicted or depressed parent.

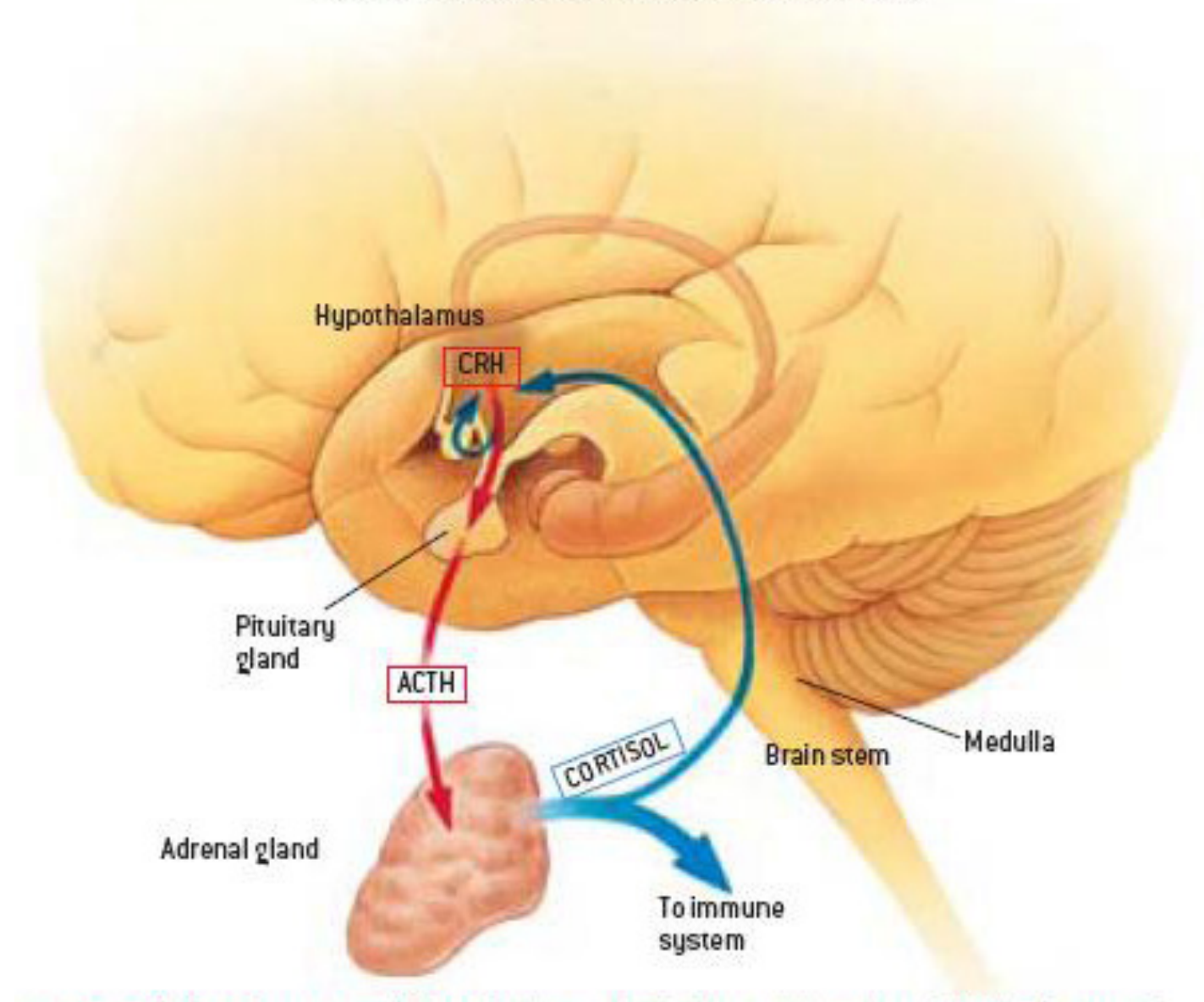
**Tolerable Stress:** Serious but temporary activation of stress response, can damage brain architecture if not buffered by supportive adult relationships; e.g., death in the family.

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



# Early Toxic Stress is Biologically Embedded and Affects Behaviour and Health

## STRESS RESPONSE SYSTEM



### Effect of Catecholamines (Adrenalin):

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

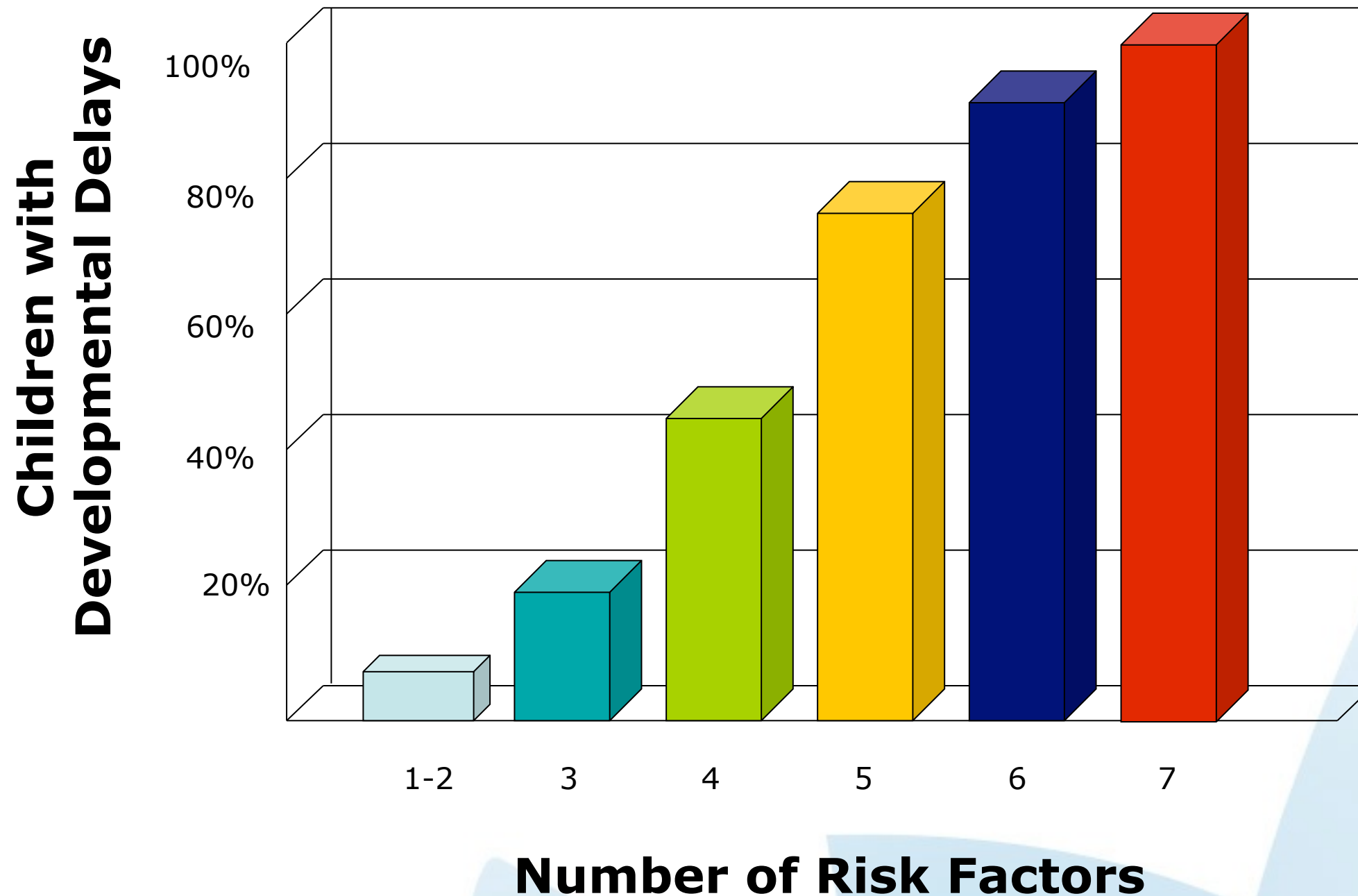
### Effect of Glucocorticoids (Cortisol):

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

# Short and Long Term Outcomes Associated with Early Adversity

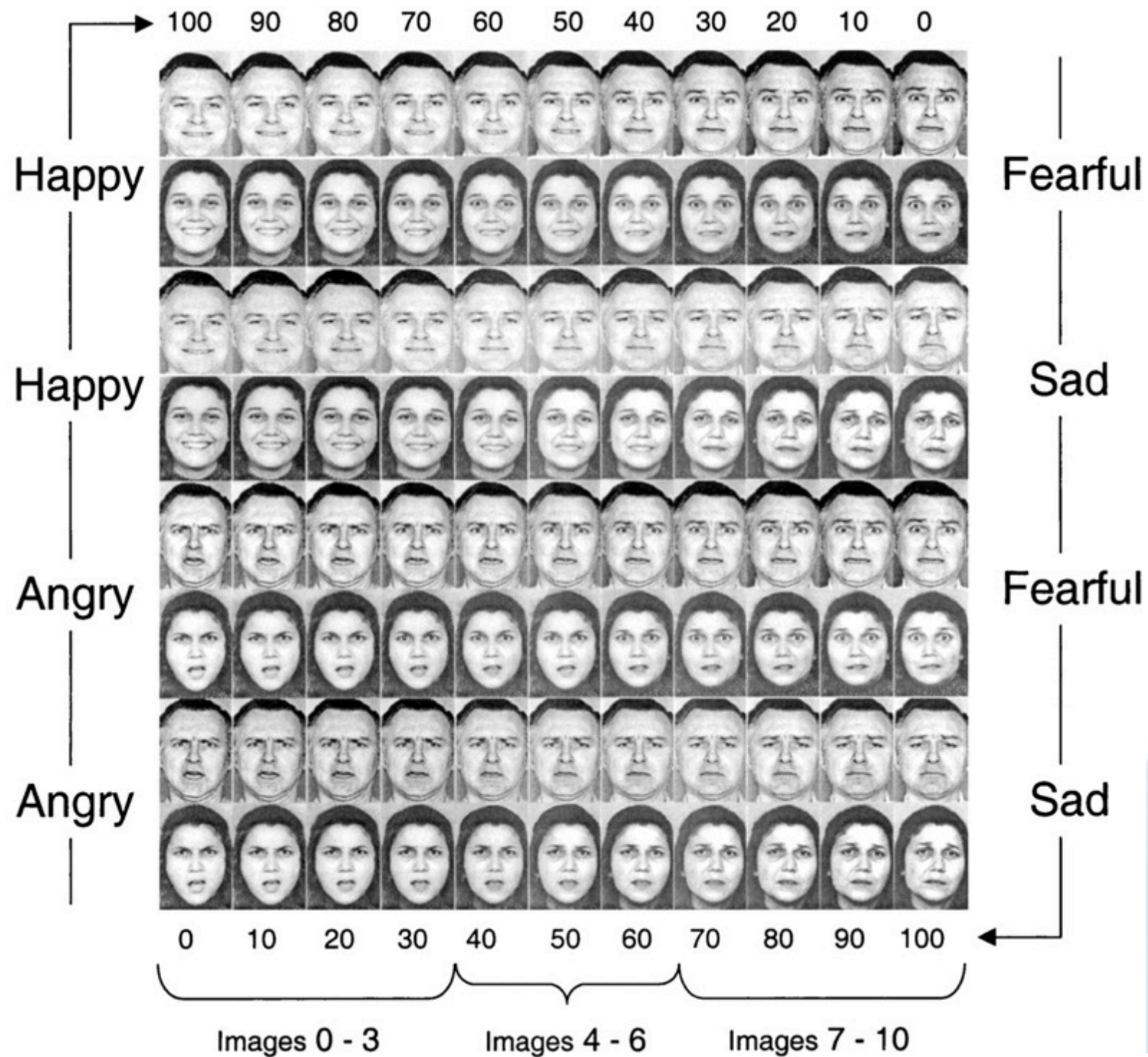


# Significant Adversity Impairs Development in the First Three Years



Source: Barth, et al. (2008)

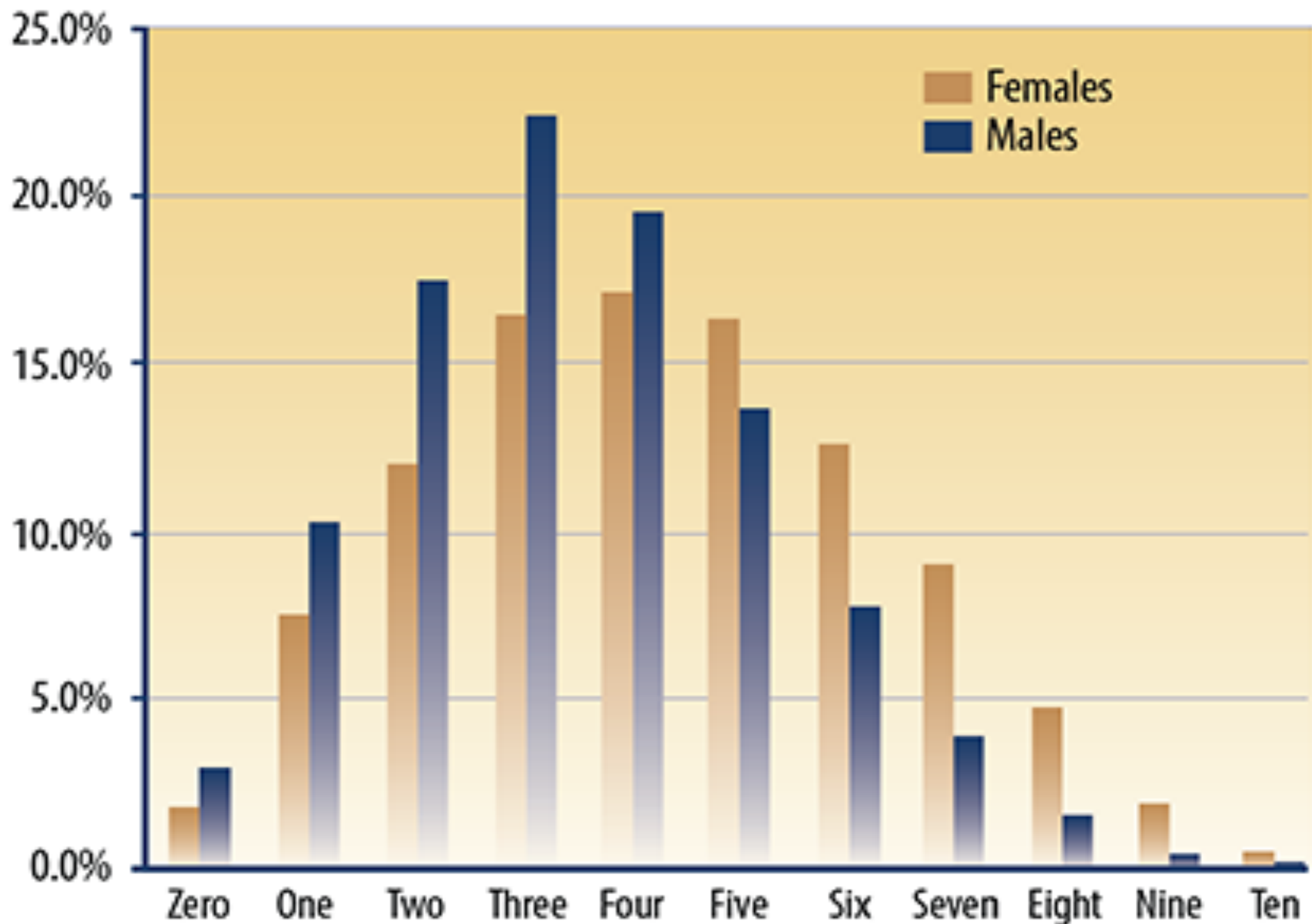
# Sensitivity to Anger in Abused Children



Pollak S D , and Kistler D J PNAS 2002;99:9072-9076

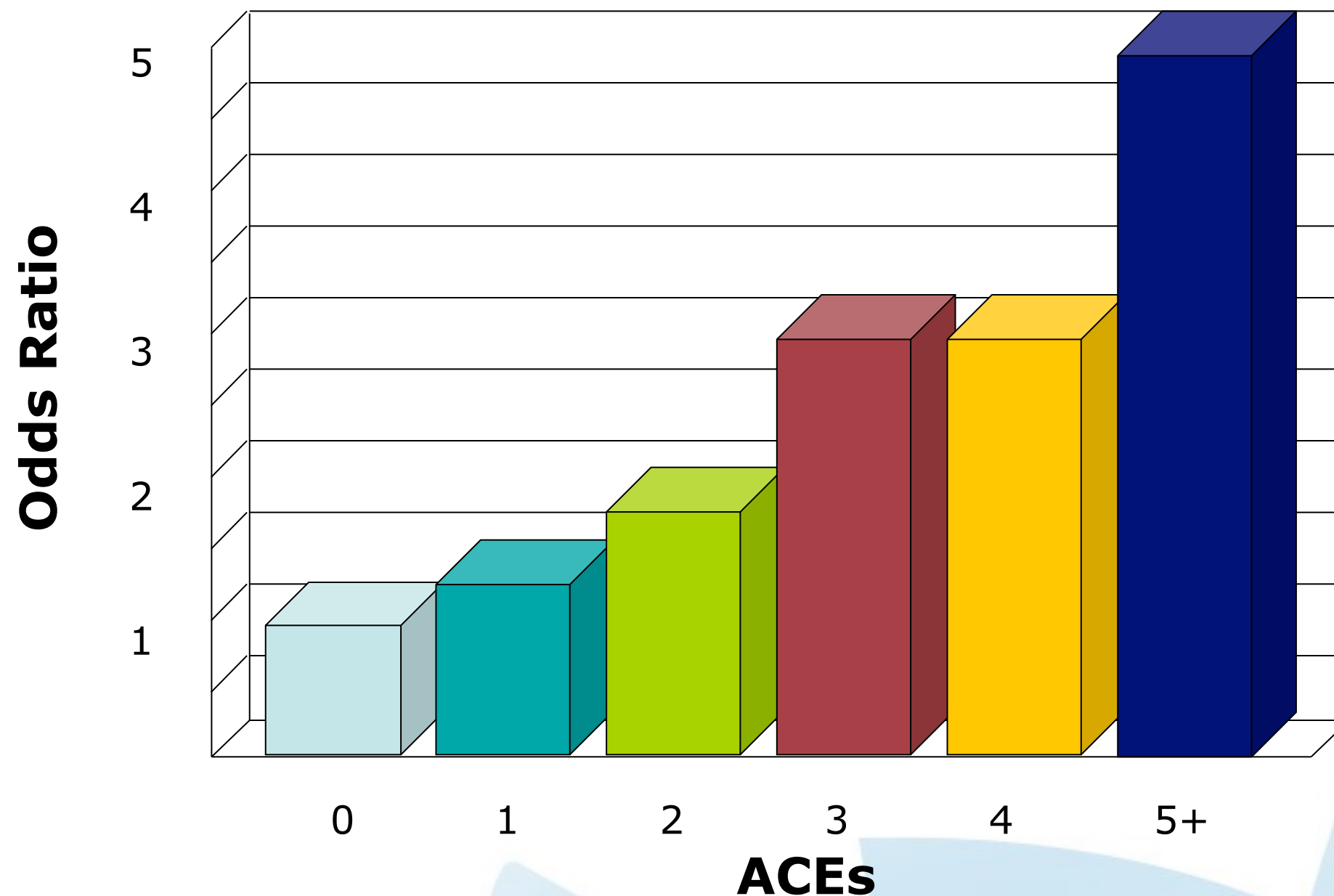


# Early Adversity is Associated With Juvenile Offending



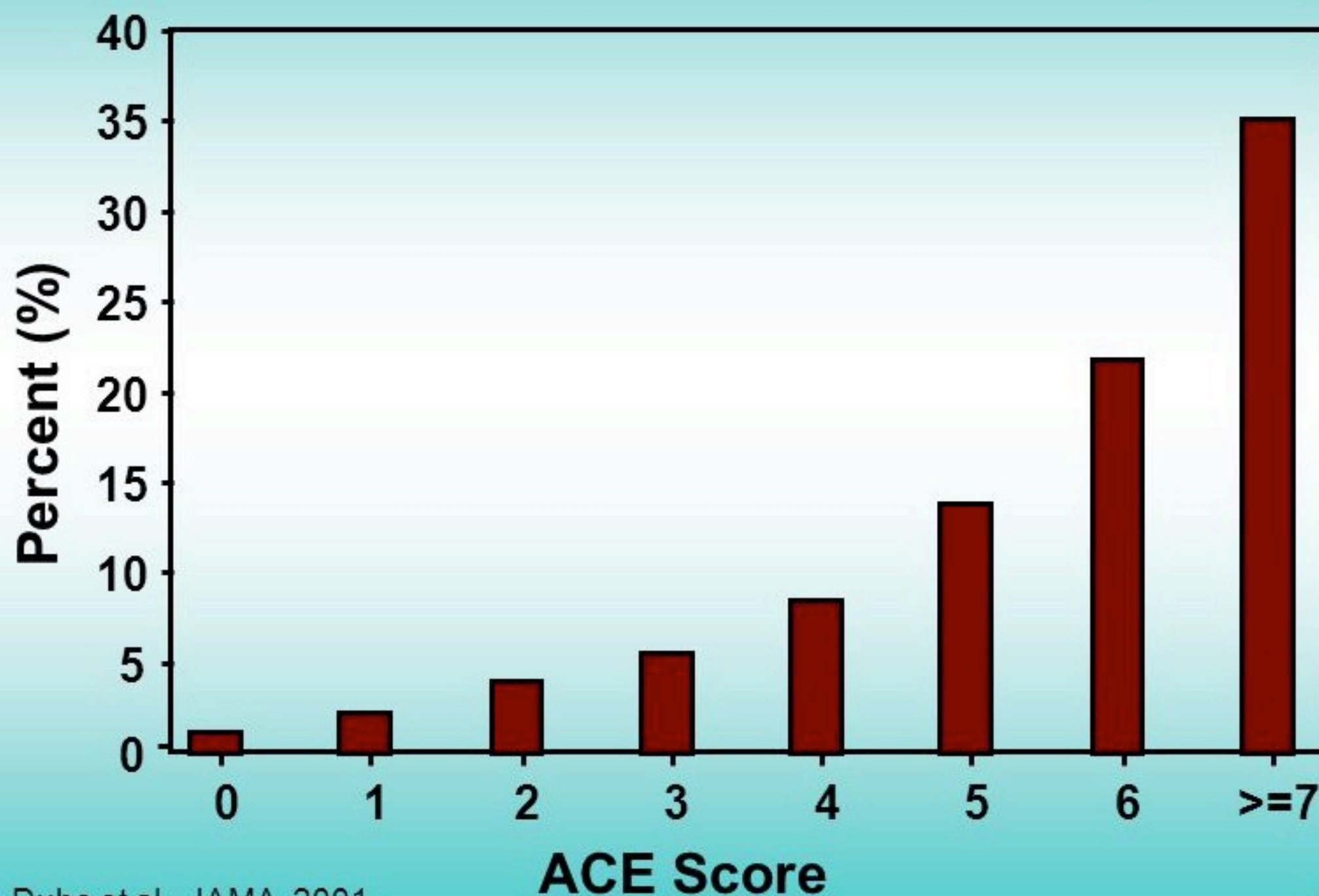
Source: Baglivio et al. (2014); N = 64,329

# Early Adversity Increases Risk for Depressive Disorders in Adulthood



Source: Chapman et al. (2004)

# Relationship Between the ACE Score and the Risk of Ever Attempting Suicide



Dube et al., *JAMA*, 2001

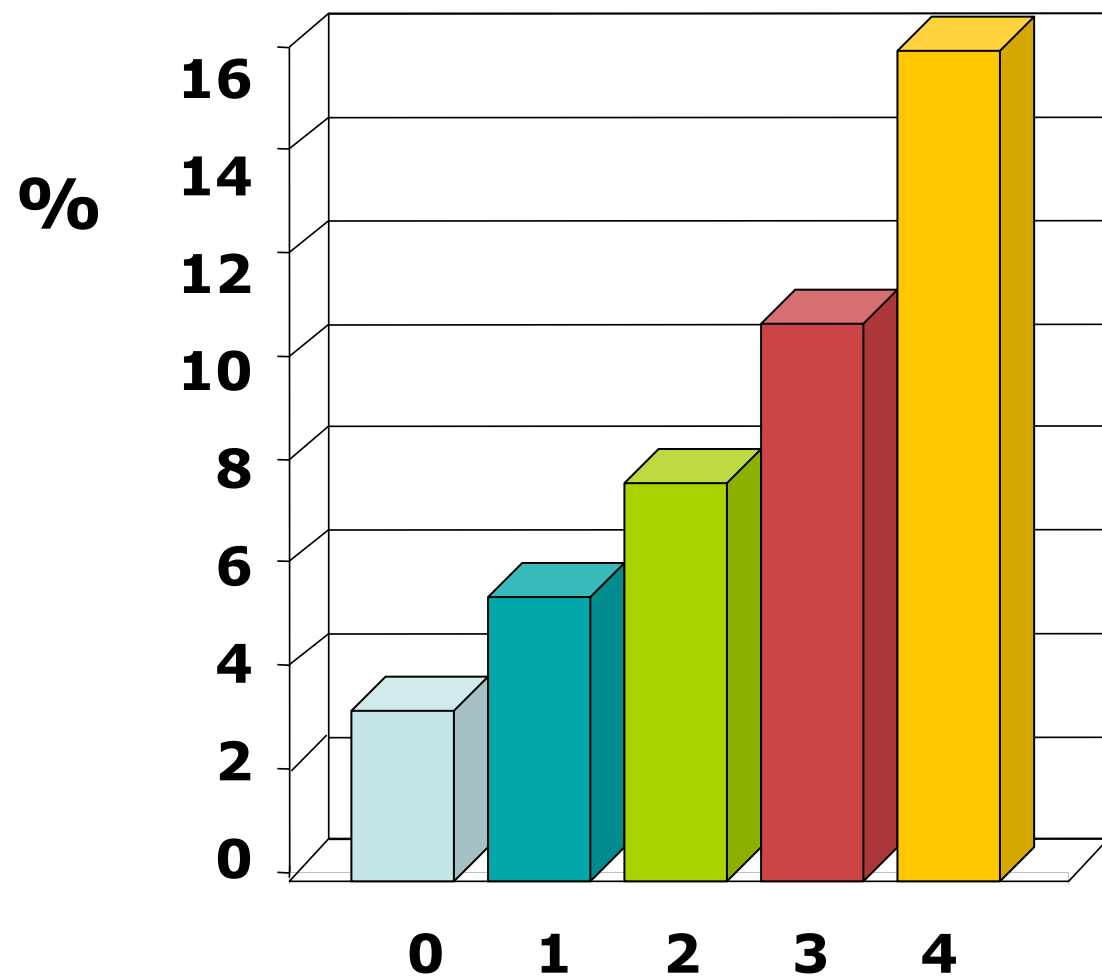
SAFER • HEALTHIER • PEOPLE





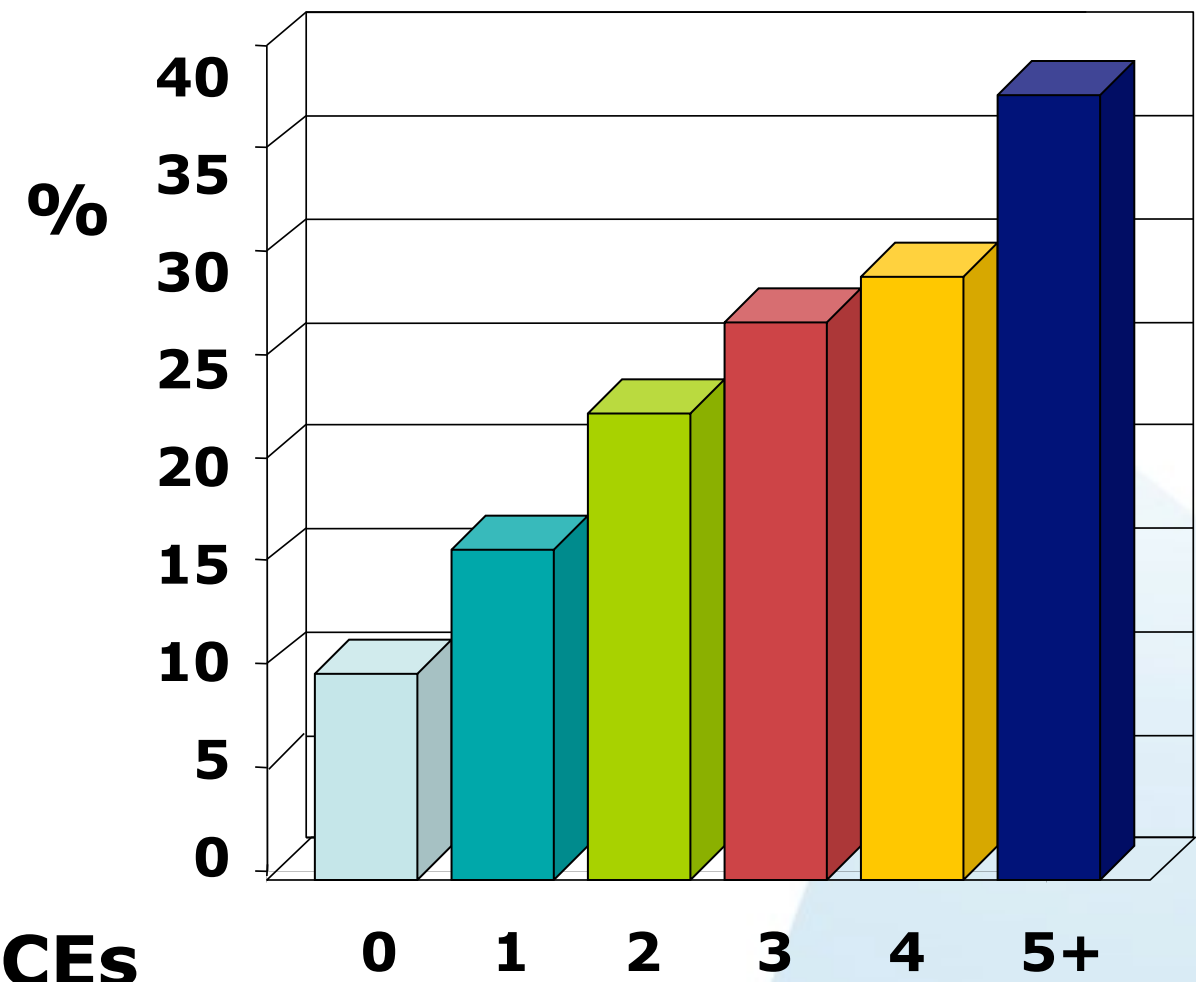
# Early Adversity Increases Risk for Substance Use Disorders in Adulthood

Self-Report: Alcoholism



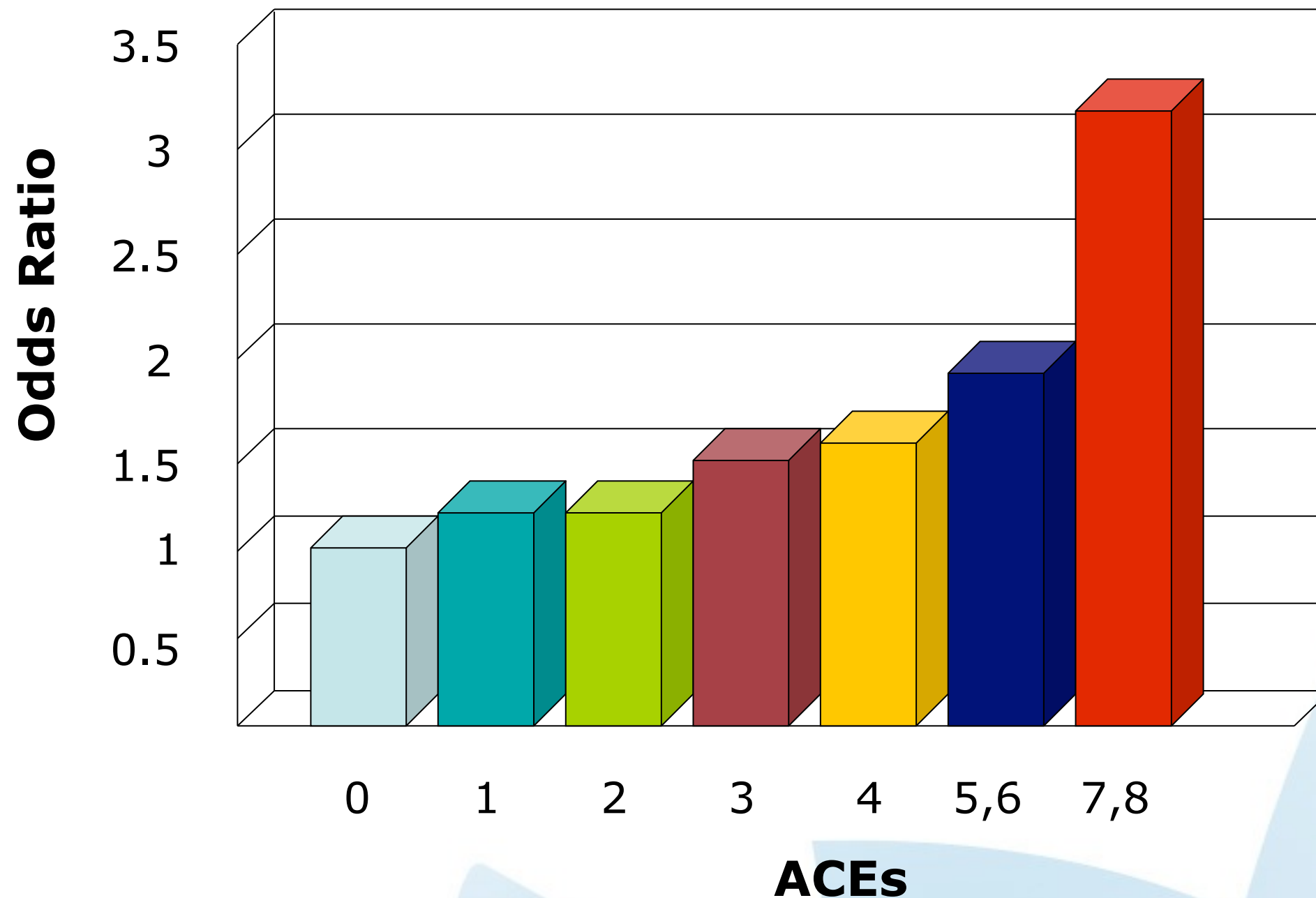
Source: Dube et al. (2002)

Self-Report: Illicit Drugs



Source: Dube et al. (2003)

# Early Adversity Increases Risk for Adult Heart Disease



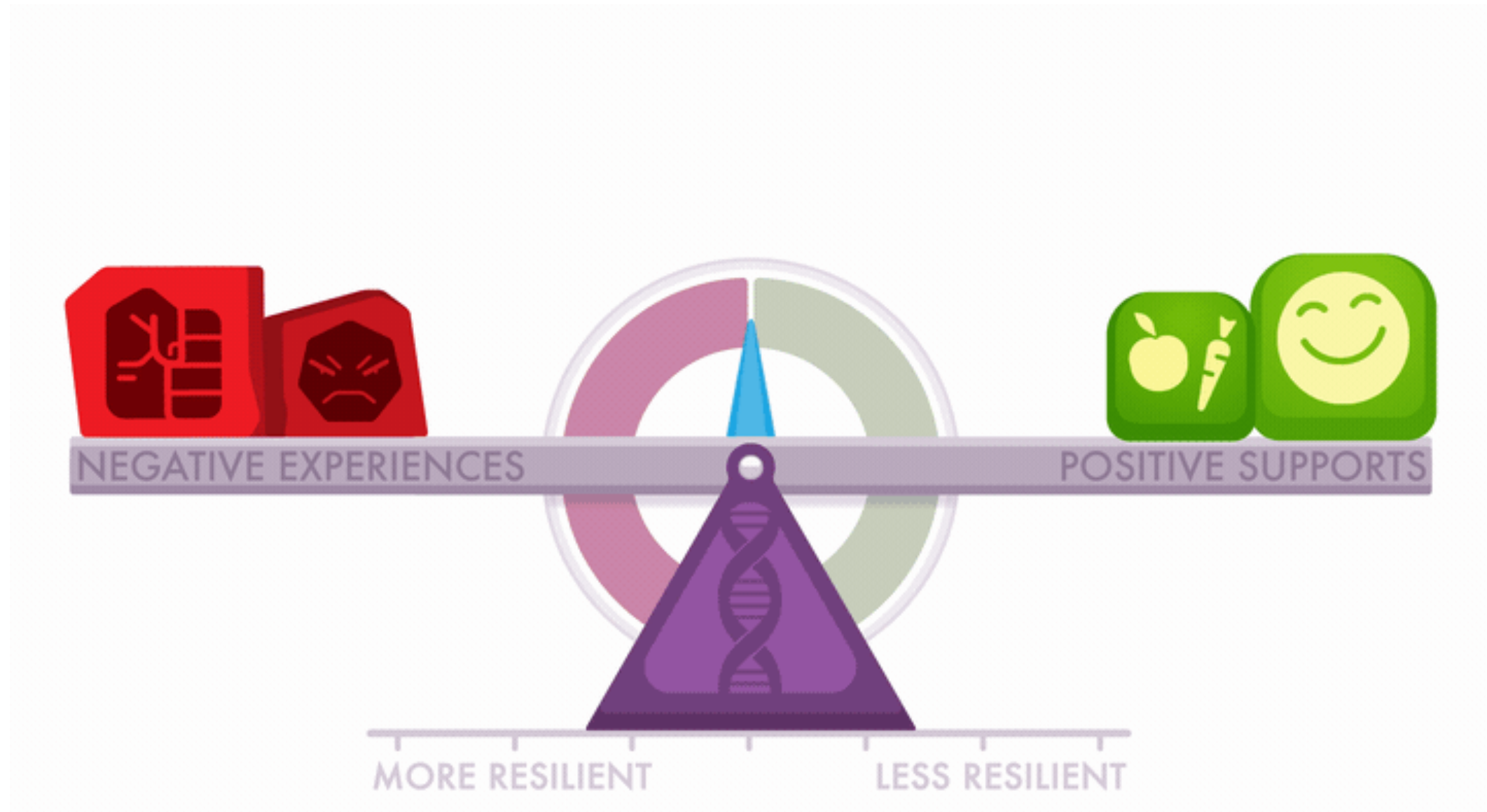
Source: Dong et al. (2004)



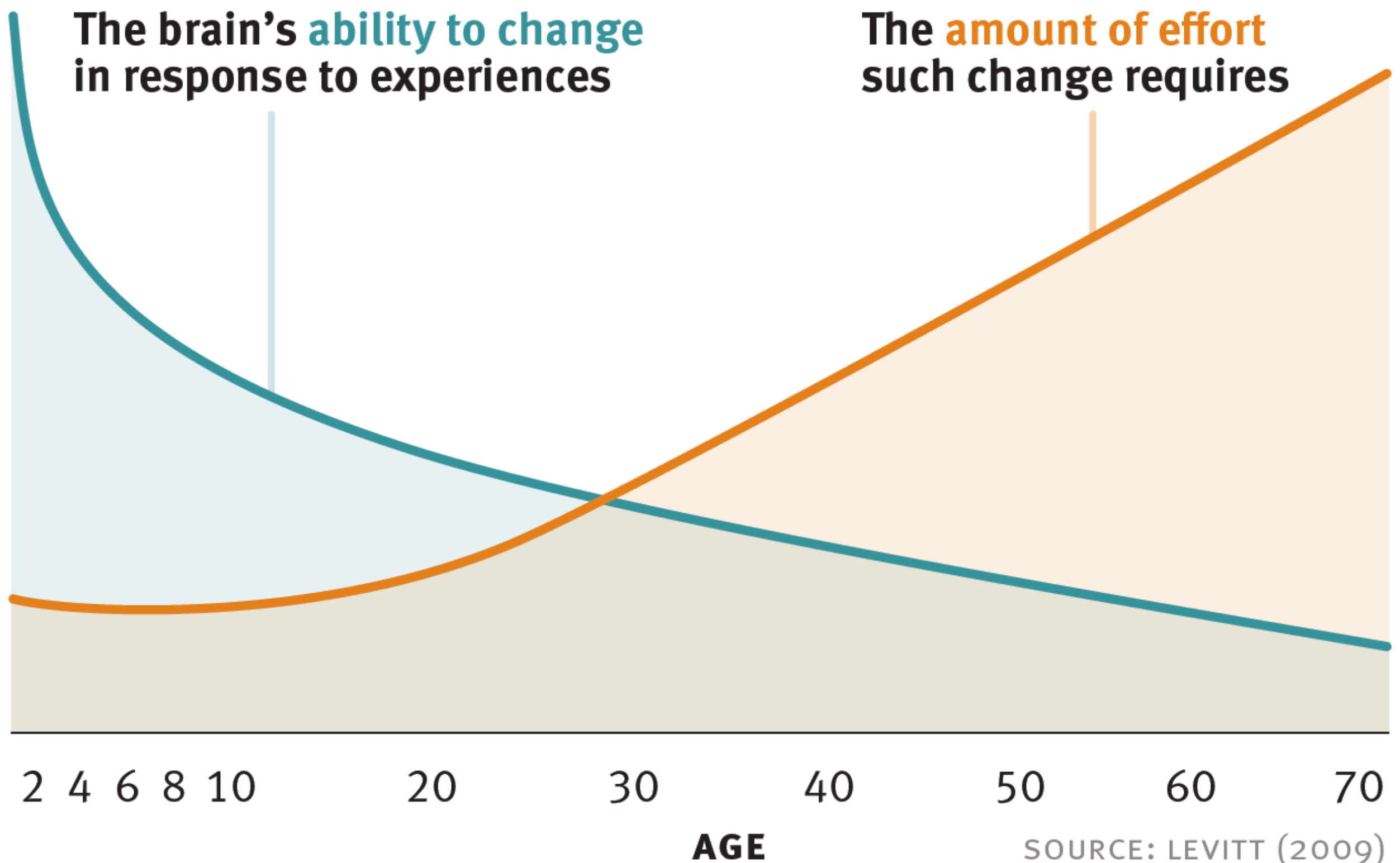
# Where Do We Go From Here?

# Building the Foundations of Resilience

Resilience is a product of our genes and experiences, like a scale that can be tipped to one side or the other.







# Alberta Family Wellness Initiative

WHERE  
**SCIENCE**  
MEETS  
**REAL LIFE**

[www.albertafamilywellness.org](http://www.albertafamilywellness.org)