



Building Resiliency Through Co-Regulation in the Face of Human Fragility
Sherri L. Alderman, MD, MPH, IMH-E, FAAP
Developmental Behavioral Pediatrician
CDC Act Early Ambassador for Oregon
AAP Oregon Chapter Child Care Contact

**Home Visiting Webinar
June 30, 2016**

fbpi.com

Disclaimer

I have no financial interests to disclose.
The views I express in this presentation are solely mine and do not necessarily represent the views of any agency.

fbpi.com

Learning Objectives

- Describe the neurochemistry origins of behavior and emotional reactivity
- Understand the utility of co-regulation in the development of self-regulation and resilience

fbpi.com

Home Visiting Competencies

- Family Health and Well-being
- Human Growth and Development
- Social Emotional Well-being

fact.com

Infant Mental Health Endorsement Core Competencies

- Pregnancy and Early Parenthood
- Relationship-Focused Practice

fact.com

Agenda

- Physical and Psychological Dynamics of Pregnancy
- Fetal Programming
- Neurochemistry of Brain Development
- Building Parenting Capacity
- Resilience

fact.com

Physical and Psychological Dynamics of Pregnancy

Physical & Psychological Dynamics of Pregnancy

- Transition
- Transformation
- Reorganization

- Inherently disruptive of body & brain
 - Physical
 - Hormonal
 - Neurochemical
 - Relationships

Zeanah 2009

Physical & Psychological Dynamics of Pregnancy

- Activation of internal representation of self, others & relationships

- Self
 - Renegotiation of identity
 - Heightened reflection
 - Resurfacing of suppressed emotions
 - Increased need for supports
 - Hope, ideals, fears

Foley & Hochman 2006
Zeanah 2009

Physical & Psychological Dynamics of Pregnancy

- 1st Trimester
 - Hormonal shifts
 - Rapid fetal development
 - High fetal vulnerability to teratogens

Foley & Hochman 2006
Zeanah 2009

fpst.com

Physical & Psychological Dynamics of Pregnancy

- 2nd Trimester
 - Hormonal stabilization
 - Physical evidence of growing fetus ("showing")
 - Quickening
 - Maternal psychological orientation inward
 - Shift toward role as mother

Foley & Hochman 2006
Zeanah 2009

fpst.com

Physical & Psychological Dynamics of Pregnancy

- 3rd Trimester
 - Physical discomfort
 - Increased oxytocin—triggering maternal behavior
 - "primary maternal preoccupation"
 - "nesting"
 - Focus on baby's arrival
 - Intense & ambivalent emotions about childbirth

Foley & Hochman 2006
Zeanah 2009

fpst.com

Physical & Psychological Dynamics of Pregnancy

- Child birth
 - Oxytocin & cortisol—reduced anxiety, increased calmness
 - Loss of bodily control
 - Mortality
 - High potential for retraumatization

Foley & Hochman 2006
Zeanah 2009

fact.com

Physical & Psychological Dynamics of Pregnancy

“A mother’s ability to adapt to the challenges and changes of pregnancy has been shown to affect children’s outcomes.”

Smaling et al. 2015

fact.com

Physical & Psychological Dynamics of Pregnancy

- Erikson’s Stages of Psychological Development
 - Early Adulthood (20-39 years old)
 - Love: Intimacy vs. Isolation
 - “Can I love?”



fact.com

Physical & Psychological Dynamics of Pregnancy

- Erikson's Stages of Psychological Development
 - Early Adulthood (20-39 years old)
 - Love: Intimacy vs. Isolation
 - "Can I love?"
 - Adolescence (13-19 years old)
 - Fidelity: Identity vs. Role Confusion
 - "Who am I?"
 - "What can I do?"



fact.com

Physical & Psychological Dynamics of Pregnancy

- Maslow's Hierarchy of Needs: Self-Actualization
 - Realization of a person's full potential
 - Excel at something (e.g., parenting)
 - Must be based on mastery of previous four



fact.com

Physical & Psychological Dynamics of Pregnancy

- Risk factors—Healthy Adaption to Parenthood
 - Prior or current psychiatric disturbance
 - Substance abuse
 - Early or ongoing trauma or DV
 - Prior pregnancy loss
 - Absence of relational, familial or social supports
 - Teen pregnancy
 - Unplanned or unwanted pregnancy
 - Poverty
 - Single parenthood
 - Transgenerational adversities & epigenetics

Zeanah 2009

fact.com

Physical & Psychological Dynamics of Pregnancy

- Evidence-based interventions to mitigate risk
 - Home Visiting Programs
 - Nurse-Family Partnership starting prenatally
 - Healthy Families America
 - Minding the Baby
 - Public Health Nurse/Mental Health Consultant Team

Zeanah 2009

fpst.com

Fetal Programming

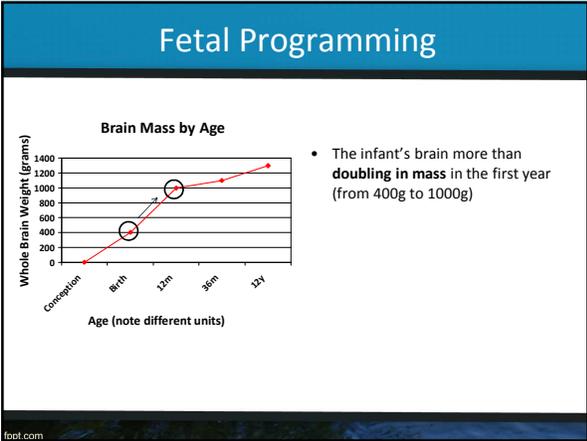
fpst.com

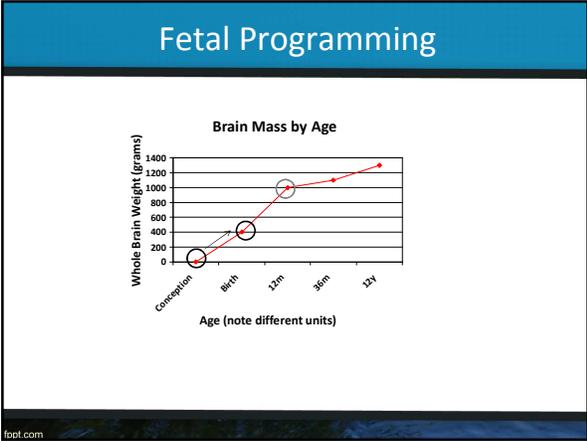
Fetal Programming

“Human development is shaped by a dynamic and continuous interaction between biology and experience.”

Perry B 2002
National Research Council & IOM 2000

fpst.com





Fetal Programming

- Neurogenesis
 - 250,000 cells/minute
- Migration
- Differentiation
- Synaptogenesis
 - 40,000 synapses/minute
 - 10,000 synapses/neuron



Cowan 1979
Bourgeois 1994

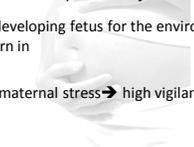
fact.com

Fetal Programming

Fetal Programming: Definition
The result of the influences of environment on the developing brain's architecture during gestation that creates persistent consequences of health & disease risk

- Prepares the developing fetus for the environment they are going to be born in
 - Survival
 - Increased maternal stress → high vigilant hypersensitive infant

Barker 1998
Glover et al. 2014

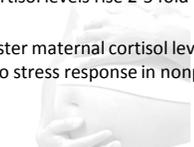


Fetal Programming

Normal pregnancy

- Maternal cortisol levels rise 2-5 fold from 1st to 3rd trimester
- By 3rd trimester maternal cortisol levels reach equivalent to stress response in nonpregnant woman

Glover et al. 2014

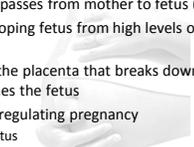


Fetal Programming

The placenta

- Controls what passes from mother to fetus (and vice versa)
- Protects developing fetus from high levels of circulating cortisol in mother
- An enzyme in the placenta that breaks down maternal cortisol before it reaches the fetus
- Plays a role in regulating pregnancy
 - Maturing fetus
 - Determining timing of delivery

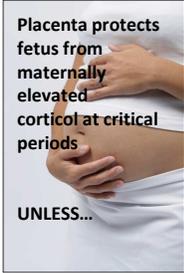
Davis & Thompson 2014



Fetal Programming

Placenta protects fetus from maternally elevated cortisol at critical periods

UNLESS...

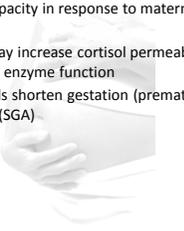


fpst.com

Fetal Programming

The placenta

- Changes filtering capacity in response to maternal chemical signals
- Maternal anxiety may increase cortisol permeability of placenta by altering enzyme function
- Prenatal stress levels shorten gestation (premature birth) and stunts fetal growth (SGA)



Glover et al. 2014

fpst.com

Fetal Programming

Outcomes

- Fetuses who experienced high maternal stress
 - Higher cortisol reaction to heel stick (Davis et al. 2011)
 - More fearful & more reactive to novelty as infants and young children (Blair et al. 2011)
 - Showed increased child stress & emotional reactivity (Buss et al. 2012, Davis et al. 2013)
- Higher levels of cortisol in amniotic fluid associated with cognitive delay (Bergman et al. 2010, Davis & Sandman 2010)

fpst.com

Fetal Programming

Maternal NUTRITION and Adult Outcomes

Nutrient need > placenta supply → fetal undernutrition

↓

Increased cortisol
Decreased insulin, IGF-1
Decreased growth hormone

↓

Blood diversion to brain
Away from liver, kidney, pancreas

Impaired cholesterol metabolism
Reduced islet cells
Reduced nephrons

Type 2 diabetes
Hypercholesterolemia
Hypertension
CV disease
Metabolic syndrome

Barker 1998, 2002
Lillicrop et al. 2009

fact.com

Fetal Programming

Pregnancy Anxiety

A negative emotional state tied to worries about the health and well-being of one's baby, the impending childbirth, of hospital and healthcare experiences, birth and postpartum, parenting or maternal role (Guardino & Schetter et al. 2014)



fact.com

Fetal Programming

Pregnancy Anxiety

- Linked to preterm birth (Rini et al. 1999, Roesch et al. 2004, Kramer et al. 2009)
- Infant attention regulation at 3-8 months after birth (Huizink et al. 2002)
- Cognitive & motor delay at 8 months (Huizink et al. 2003)
- Reduced gray matter volume at 6-9 yo (Buss et al. 2010)

fact.com

Fetal Programming

Risk Factors for Pregnancy Anxiety

- Low self-esteem
- Low perceived control of important outcomes
- Pessimistic about one's future
- Lack of social supports (including with baby's father)
- Low income
- First pregnancy



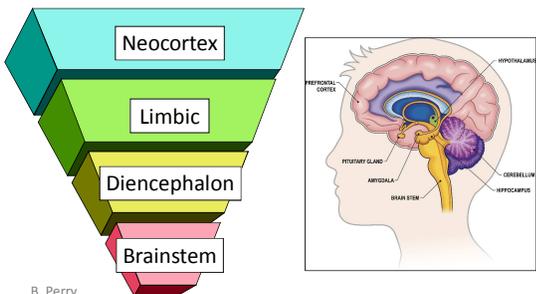
Rini et al. 1999
Gurung et al. 2005

fact.com

Neurochemistry of Brain Development

fact.com

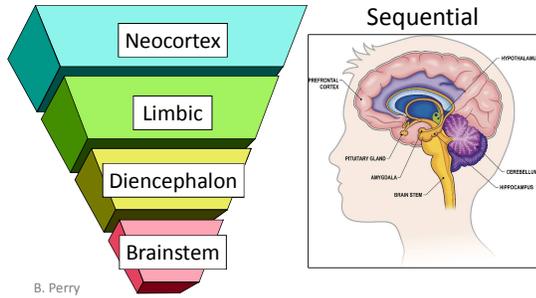
Neurochemistry of Brain Development



B. Perry

fact.com

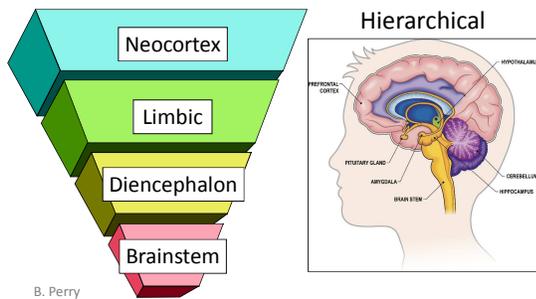
Neurochemistry of Brain Development



B. Perry

fact.com

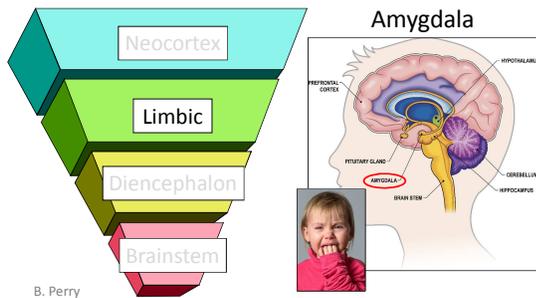
Neurochemistry of Brain Development



B. Perry

fact.com

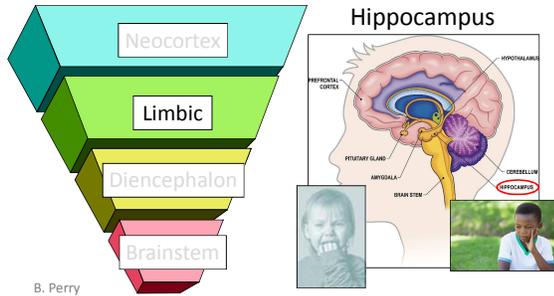
Neurochemistry of Brain Development



B. Perry

fact.com

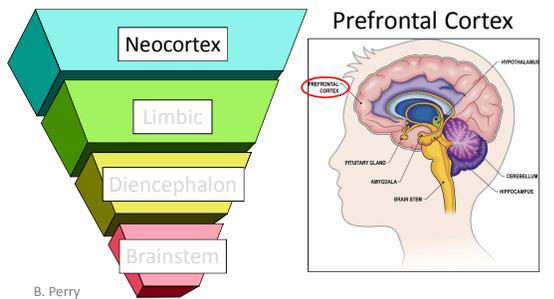
Neurochemistry of Brain Development



B. Perry

fact.com

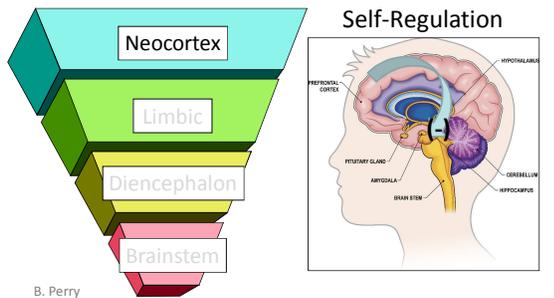
Neurochemistry of Brain Development



B. Perry

fact.com

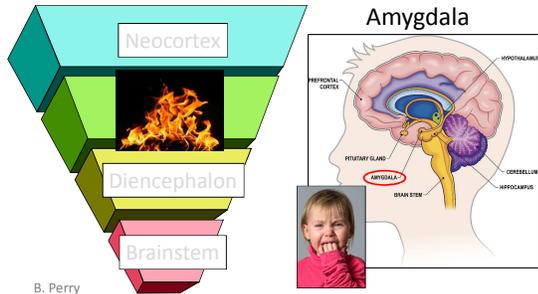
Neurochemistry of Brain Development



B. Perry

fact.com

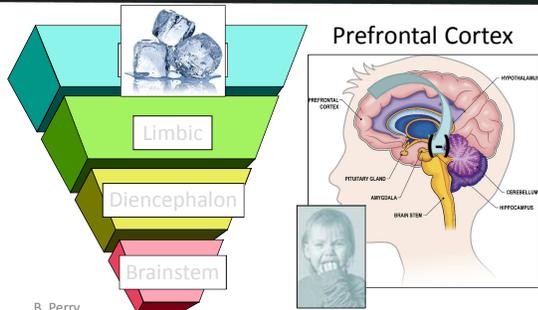
Neurochemistry of Brain Development



B. Perry

fact.com

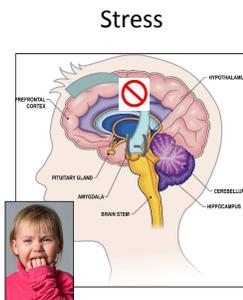
Neurochemistry of Brain Development



B. Perry

fact.com

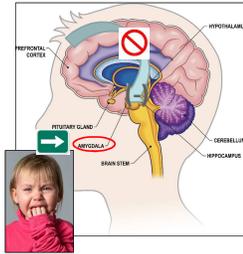
Neurochemistry of Brain Development



fact.com

Neurochemistry of Brain Development

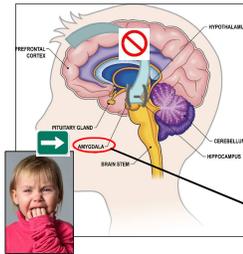
Stress



fact.com

Neurochemistry of Brain Development

Stress



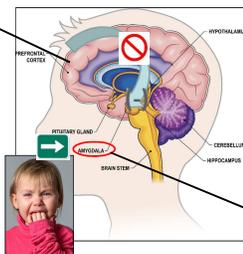
Hypertrophy
overgrowth

fact.com

Neurochemistry of Brain Development

Hypoplasia
under developed

Stress



Hypertrophy
overgrowth

fact.com

Neurochemistry of Brain Development

Toxic Stress



« What Sleeping Babies Hear »

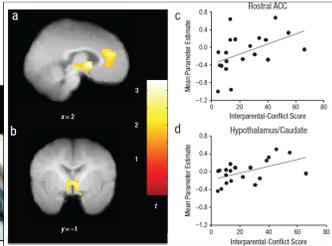
- Interparental conflict correlates with heightened brain activity in sleeping babies exposed to very angry tone of voice
- Rostral anterior cingulate cortex
- Subcortical regions (caudate, thalamus and hypothalamus)
- Rostral ACC implicated in emotional processing & regulation

Graham 2013

fact.com

Neurochemistry of Brain Development

Toxic Stress



Graham 2013

fact.com

Neurochemistry of Brain Development



Temperament?



fact.com

Neurochemistry of Brain Development



Temperament?

Placenta protects fetus from maternally elevated cortisol at critical periods



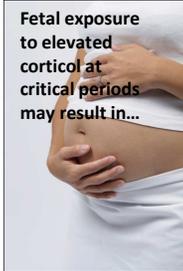
fact.com

Neurochemistry of Brain Development



Temperament?

Fetal exposure to elevated cortisol at critical periods may result in...



fact.com

Neurochemistry of Brain Development



Temperament?

Intrauterine growth restriction

Enhanced reactivity



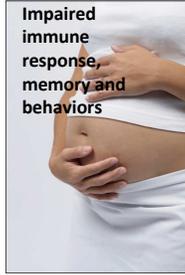
fact.com

Neurochemistry of Brain Development



Temperament?

Impaired
immune
response,
memory and
behaviors



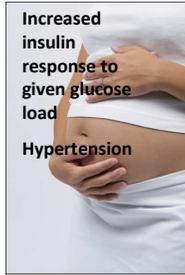
fact.com

Neurochemistry of Brain Development



Temperament?

Increased
insulin
response to
given glucose
load
Hypertension



fact.com

Neurochemistry of Brain Development



Life style choices?

Metabolic
Syndrome



fact.com

Building Parenting Capacity

fact.com

Building Parenting Capacity

Mirror Neurons

- **Motor cortex & posterior parietal cortex are activated** not only during the action execution but also **when observing the action**
- Other's behaviors, emotions and sensations are mapped into our **internal motor representation** creating a direct communication between self & others



Ammaniti & Ferrari 2013

fact.com

Building Parenting Capacity

Mirror Neurons

- Code not only the **WHAT** of an action but the **WHY** or underlying intent
- Allow the **capacity to anticipate, predict and prepare** the body for interaction
- Allow for **sharing goals and intentions**



Ammaniti & Ferrari 2013

fact.com

Building Parenting Capacity

Internal Working Model

- Internalization of sense of self—beginning ~6 months, established by 1 yr
- I am an autonomous person
- I am the author of my own actions
- My actions affect others
- Others are individuals with feelings and intentions different from my own



Ammaniti & Ferrari 2013

fact.com

Building Parenting Capacity

Reflective Functioning: Definition

Mother's ability to think about herself as a parent, her child and the relationship with her child in terms of mental states and to use this understanding to guide her responses to the child



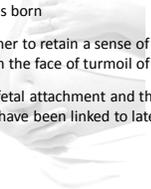
Smaling et al. 2015
Zeanah 2009

fact.com

Building Parenting Capacity

During pregnancy

- Allows the mother to imagine the baby as having a mind of his or her own, coherent and knowable, both in her mind and after he or she is born
- Allows the mother to retain a sense of herself as coherent and knowable in the face of turmoil of pregnancy
- Both maternal-fetal attachment and the quality of prenatal representation have been linked to later infant security



Smaling et al. 2015
Zeanah 2009

fact.com

Building Parenting Capacity

Allows for:

- Anticipation, recognition of the child's state of mind and respond sensitively
- Balanced mental representations of the child
- Can be learned and coached (intervention)



Cassiday & Shaver 2008
Stover 2014

fbst.com

Building Parenting Capacity

Being able to recognize the child's state of mind and verbalize it

- expresses respect for the child as an individual,
- moves the feelings from the right to the left brain
- while staying engaged and regulated, carrying the child to a more regulated state



fbst.com

Building Parenting Capacity

Protective:

- More predictive of infant security than adult attachment classification
- Protective in instances of trauma
- Mothers with substance abuse issues with RF skills have decreased likelihood of relapse and foster care placement of child



Cassiday & Shaver 2008
Stover 2014
Pajulo 2012

fbst.com

Building Parenting Capacity

Prenatally

- Hopes
- Fears
- Sleep/wake patterns
- Talking about unborn child's ability to see, hear, feel



- Attributes given to fetal movement
- Wondering
- Giving voice to the unborn child

fact.com

Building Parenting Capacity

Examples Prenatally:

- Giving voice to the baby

"Mommy, I love when you talk softly to me."
"Mommy, I get frustrated, too, when I get the hiccups!"



fact.com

Building Parenting Capacity

Examples after birth:

- Acknowledging child's feelings of disappointment while setting and holding to set limits

"You really want to go to the park now but..."
"You are sad that Daddy has to stay late at work tonight."

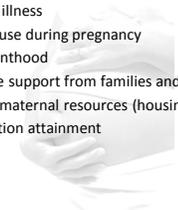


fact.com

Building Parenting Capacity

Risk Factors

- Psychiatric illness
- Substance use during pregnancy
- Single parenthood
- Unavailable support from families and friends
- Scarcity of maternal resources (housing, financial)
- Low education attainment

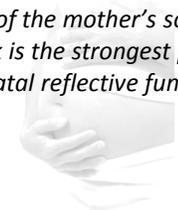


Smaling 2015

fact.com

Building Parenting Capacity

The size of the mother's social support network is the strongest predictor of prenatal reflective functioning.



Smaling 2015

fact.com

Building Parenting Capacity

REWARD CIRCUIT
A dopaminergic (& GABA & opiates) communication involving a collection of brain structures that attempts to regulate and control behavior by inducing pleasurable effects



- Mesocorticolimbic DA pathways
- Involves ventral tegmental area, nucleus accumbens, PFC, amygdala, hippocampus
- Neural activation in the reward circuit facilitates maternal motivation to provide sensitive care for her infant

fact.com

Building Parenting Capacity

REWARD CIRCUIT



- Early postpartum period involves **normative biological changes** supportive of adaptation of parenthood including:
 - Reduced stress reactivity
 - Increased sensitivity to the infant
- Increased neural activity in the reward circuit is positively associated with maternal sensitivity:
 - Positive emotion
 - Affective touch
 - Direct gaze
 - Positive perceptions of infant

Kim 2011

fact.com

Building Parenting Capacity

REWARD CIRCUIT



- Early postpartum period involves **normative biological changes** supportive of adaptation of parenthood including:
 - Reduced stress reactivity
 - Increased sensitivity to the infant
- Increased neural activity in the reward circuit is positively associated with maternal **sensitivity**:
 - Positive emotion
 - Affective touch
 - Direct gaze
 - Positive perceptions of infant

Kim 2011

fact.com

Building Parenting Capacity



Positive Feedback Loop

- Positive maternal feelings about her infant and her **parenting experience** play a critical role in activation of the reward circuit
- Mother-infant interactions enhance reward circuit activation and foster maintenance of positive parental behaviors and attentiveness and sensitive caregiving

fact.com

Building Parenting Capacity



- Chronic stress and poverty negatively impact reward circuit activation & function and maternal motivation
- Higher maternal negative reactivity to her infant's cry impedes her responsiveness and adversely impacts sensitivity
- Lack of maternal sensitivity increases the infant's stress level and emotional dysregulation
- Challenges with comforting, feeding, sleep jeopardize parental confidence & self-efficacy
- Parental disengagement results in insecure attachment

fact.com Taylor et al. 2006

Building Parenting Capacity

By 3-4 months post-partum, infants are more socially interactive and parents increasingly engage in reciprocal positive interactions

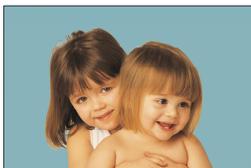


fact.com Mercer 1985

Building Parenting Capacity

Following challenge (at 33 mo.) maternal sensitivity in infancy

- better effortful emotional control and
- shorter time to emotional recovery to positive state following challenge at 33m.



fact.com Conway et al. 2014

Building Parenting Capacity

Secure attachment + sensitive care → higher social & cognitive measures



Insecure attachment + insensitive care → lower social & cognitive measures

Attachment at 15m
Sensitivity at 24m
Testing at 36m

Belsky & Fearon 2002

fbpi.com

Building Parenting Capacity

Secure attachment + sensitive care → higher social & cognitive measures



Insecure attachment + insensitive care → lower social & cognitive measures

Attachment at 15m
Sensitivity at 24m
Testing at 36m

Belsky & Fearon 2002

fbpi.com

Building Parenting Capacity

Insecure attachment + sensitive care → higher social & cognitive measures



Secure attachment + insensitive care → lower social & cognitive measures

Attachment at 15m
Sensitivity at 24m
Testing at 36m

Belsky & Fearon 2002

fbpi.com

Building Parenting Capacity

Secure attachment + sensitive care → higher social & cognitive measures

Insecure attachment + sensitive care → higher social & cognitive measures

Attachment at 15m
Sensitivity at 24m
Testing at 36m

Belsky & Fearon 2002

fact.com

Building Parenting Capacity

Insecure attachment + sensitive care → higher social & cognitive measures

Secure attachment + insensitive care → lower social & cognitive measures

Maternal Report (at 24 m)

Life stress

Depression

Social supports

Family resources

Attachment at 15m
Sensitivity at 24m
Testing at 36m

Belsky & Fearon 2002

fact.com

Building Parenting Capacity

PARENTAL CONFIDENCE

- Secure relationship requires maternal emotional availability and engagement
- Lack of parental confidence instills insecurity in the relationship
- Emotional availability impaired by:
 - Maternal depression
 - Affect dysregulation
 - Lack of parental self-efficacy
 - Tendency to use unhealthy externalizing behaviors to reduce tension & distress

Fulton 2012
Kim 2011

fact.com

Building Parenting Capacity

Providing parent of irritable child:
 - Support
 - Parent training on sensitivity
 shifted insecure attachment to....

van den Boom 1989

fbpi.com

Building Parenting Capacity

Secure attachment

van den Boom 1989

fbpi.com

Resilience

Resilience

fbpi.com

Resilience

Resilience

- The set of skills needed to respond to adversity and thrive
- Situation-specific
- Developmental process
- Results from the dynamic interaction between internal predispositions and external experiences



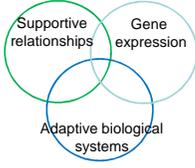
National Scientific Council on the Developing Child 2015

fact.com

Resilience

Factors for Building Resilience

- The capacity to adapt and survive despite adversity develops through the interaction of:




National Scientific Council on the Developing Child 2015

fact.com

Resilience

Factors for Building Resilience

- 1960's: Head Start, school readiness
- 1980's: Home Visiting, parent-child relationships
- 1990's: Early Intervention, earlier intervention as prevention
- 2010's: Quality Childcare, enriched environments



fact.com

Resilience

Means of Building Resilience

- Providing basic physiological needs (food, housing)
- Financial stability
- Social supports
- Addressing MH and substance abuse issues
- Parenting education
- Early intervention/home visiting beginning prenatally
- Minimization of retraumatization
- Opportunities for repair
- Trauma informed workplace



fact.com

Summary

- Healthy pregnancy includes physical, psychological and social adaptive changes.
- Adaptation to parenthood is founded on basic physiological needs being met.
- Human development is shaped by a continuous interaction between biology and environment beginning during pregnancy.
- Chronic stress adversely affects brain architecture and neurochemical reactions to environment that are evident as early as at birth.
- Prenatal representations of the developing child by the mother and perinatal biological changes are linked to secure attachment and parent sensitivity.
- Addressing risk factors for unhealthy pregnancy and child outcomes builds resilience.
- Resilience-building begins in the workplace.

fact.com

Q&A

Q&A

fact.com



Building Resiliency Through Co-Regulation in the Face of Human Fragility

Sherril L. Alderman, MD, MPH, IMH-E, FAAP
 Developmental Behavioral Pediatrician
 CDC Act Early Ambassador for Oregon
 AAP Oregon Chapter Child Care Contact

Thank you!

fbpi.com

REFERENCES

Ammaniti M, Ferrari P (2013). "Vitality affects in Daniel Stern's thinking—A psychological and neurobiological perspective," *Infant Mental Health Journal* 34(5), 367-375.

Barker DJP (1998). In Utero Programming of Chronic Disease, *Clinical Science*, 95(2), 115-128.

Barker DJP (2002). Fetal Programming of Coronary Heart Disease, *TRENDS in Endocrinology & Metabolism* 13(9), 364-368.

Blair MM, Glynn LM, Sandman CA, Davis EP (2011). "Prenatal Maternal Anxiety and Early Childhood Temperament," *Stress* 14(6), 644-651.

Bourgeois JP, Goldman-Rakic PS, Rakic P (1994). Synaptogenesis in the Prefrontal Cortex of Rhesus Monkeys, *Cerebral Cortex* 4(1), 78-96.

Cowan WM (1979). The Development of the Brain, *Scientific American*, 241, 112-133.

fbpi.com

REFERENCES

Buss C, Davis EP, Muftuler LT, et al. (2010). High Pregnancy Anxiety During Mid-Gestation Is Associated with Decreased Gray Matter Density in 6-9-year-old Children, *Psychoneuroendocrinology* 35(1), 141-153.

Buss C, Davis EP, Shahbaba B, Pruessner JC, Head K, Sandman CA (2012). Maternal Cortisol over the Course of Pregnancy and Subsequent Child Amygdala and Hippocampus Volumes and Affective Problems, *Proceedings of the National Academy of Sciences* 109(20), e1312-1319.

Belsky J & Fearon RM (2002). Early attachment security, subsequent maternal sensitivity, and later child development: Does continuity in development depend upon continuity of caregiving? *Attachment and Human Development*, 4, 361-387.

Buss C, Entringer S, Swanson JM, et al. (2012). The Role of Stress in Brain Development: The Gestational Environment's Long-Term Effects on the Brain, Dana Organization, <http://dana.org/Cerebrum/Default.aspx?id=39474> Retrieved March 20, 2016.

fbpi.com

REFERENCES

Cassidy J, Shaver PR (2008). *Handbook of Attachment: Theory, Research and Clinical Applications*, New York, New York: The Guilford Press.

Davis EP, Glynn LM, Waffarn F, Sandman CA (2011). Prenatal Maternal Stress Programs Infant Stress Regulation, *Journal of Child Psychology and Psychiatry* 52(2), 1990-129.

Conway A, McDonough SC, MacKenzie M, et al. (2014). Maternal sensitivity and latency to positive emotion following challenge: Pathways through effortful control, *Infant Mental Health Journal*, 35(3), 274-284.

Davis EP, Sandman CA (2010). The Timing of Prenatal Exposure to Maternal Cortisol and Psychosocial Stress Is Associated with Human Infant Cognitive Development, *Child Development* 81(1), 131-148.

Davis EP, Sandman CA, Buss C, Wing DA, Head K (2013). Fetal Glucocorticoid Exposure Is Associated with Preadolescent Brain Development, *Biological Psychiatry*, 74(9), 647-655.

fbst.com

REFERENCES

Davis EP, Thompson RA (2014). Prenatal Foundations: Fetal Programming of Health and Development, *Journal of Zero to Three*, 34(4), 6-11.

Foley GM, Hochman JD (2006). *Mental Health in Early Intervention: Achieving Unity in Principles and Practice*, Baltimore, Maryland: Brookes Publishing Co.

Fulton JM, et al. (2012). Maternal perceptions of the infant: Relationship to maternal self-efficacy during the first six weeks postpartum, *Infant Mental Health Journal* 33(4), 329-338.

Glover V, O'Connor TG, O'Donnell K, Capron L (2014). How Prenatal Depression, Anxiety, and Stress May Affect Child Outcome: The Placenta and Child Development, *Zero to Three* 34(4), 22-28.

Guardino CM, Schetter CD (2014) Understanding Pregnancy Anxiety: Concepts, Correlates and Consequences, *Zero to Three* 34(4), 12-21.

Gurung RAR, Dunkel-Schetter C, Collins N, Rini C, Hobel CJ (2005). Psychosocial Predictors of Prenatal Anxiety, *Journal of Social and Clinical Psychology* 24(4), 497-519.

fbst.com

REFERENCES

Huizink AC, Robles de Medina PG, Mulder EIJ, et al. (2002). Psychological Measures of Prenatal Stress as Predictors of Infant Temperament, *Journal of the Academy of Child & Adolescent Psychiatry* 44(6), 1078-1085.

Huizink AC, Robles de Medina PG, Mulder EIJ, et al. (2003). Stress During Pregnancy Is Associated with Developmental Outcome in Infancy, *Journal of Child Psychology and Psychiatry* 44(6), 810-818.

Kim P, et al. (2011). Breastfeeding, brain activation to own infant cry, and maternal sensitivity. *Journal of Child Psychology and Psychiatry*, 52, 907-915.

Kramer MS, Lydon J, Seguin L, et al. (2009). Stress Pathways to Spontaneous Preterm Birth: The Role of Stressors, Psychological Distress and Stress Hormones, *American Journal of Epidemiology* 169(11), 1319-1326.

Lillycrop KA, Hanson MA, Burdge GC (2009). Epigenetics and the Influence of Maternal Diet, *Early Life Origins of Human Health and Disease*, Ed. Newnham JP & Ross MG, pp 11-20, Karger: Basel, Switzerland.

Mercer RT (1985). The process of maternal role attainment over the first year, *Nursing Research* 34, 198-204.

fbst.com

REFERENCES

- National Research Council and Institute of Medicine (2000) *From Neurons to Neighborhoods: The Science of Early Childhood Development*. Jack P. Shonkoff and Deborah A Phillips, eds. Board on Children, Youth, and Families, Commission on Behavioral and Social Sciences and Education. Washington, D.C. National Scientific Council on the Developing Child, (2005). *Excessive Stress Disrupts the Architecture of the Developing Brain: Working Paper #3*, Accessed November 4, 2012, at <http://www.developingchild.net>.
- Perry B (2002). Childhood experiences and the expression of genetic potential: What childhood neglect tells us about nature and nurture. *Brain and Mind* 3, 79-100.
- Rini CK, Wadhwa PD, Sandman CA (1999). Psychological Adaptation and Birth Outcomes: The Role of Personal Resources, Stress and Sociocultural Context in Pregnancy, *Health Psychology* 1(4), 333-345.
- Roesch SC, Schetter CD, Woo G, et al. (2004). Modeling the Types and Timing of Stress in Pregnancy, *Anxiety, Stress, and Coping* 17(1), 87-102.

fpd.com

REFERENCES

- Smaling HJA, Huijbregts SCJ, Suurland J, van der Heijden KR (2015). Prenatal Reflective Functioning in Primiparous Women with a High-Risk Profile, *Infant Mental Health Journal* 36(3), 251-261.
- Stover CS, Kiselica A (2014). An Initial Examination of the Association of Reflective Functioning to Parenting of Fathers, *Infant Mental Health Journal* 35(5), 452-461.
- Taylor SE, et al. (2006). Neural responses to emotional stimuli are associated with childhood family stress, *Biological Psychiatry* 60, 296-301.
- van den Boom DC (1989). Do first-year interventions endure? Follow-up during toddlerhood of a sample of Dutch irritable infants. *Child Development*, 66(6), 1798-1816.
- Zeanah, Jr. CH ed. (2009). *Handbook of Infant Mental Health, Third Edition*, New York, New York: The Guilford Press.

fpd.com
