Building Brains by *Making Connections*

Claire Watson, MSc, Dip., TIRP
Psychology Foundation of Canada

Emis Akbari, Ph.D
The Atkinson Centre for Society and Child Development

Objectives

- Explore the correspondence between evidence-based parent- child attachment activities and what is taking place inside a child's brain.

- Review new brain research that supports the role of experience as well as genetics in the building of healthy brains.

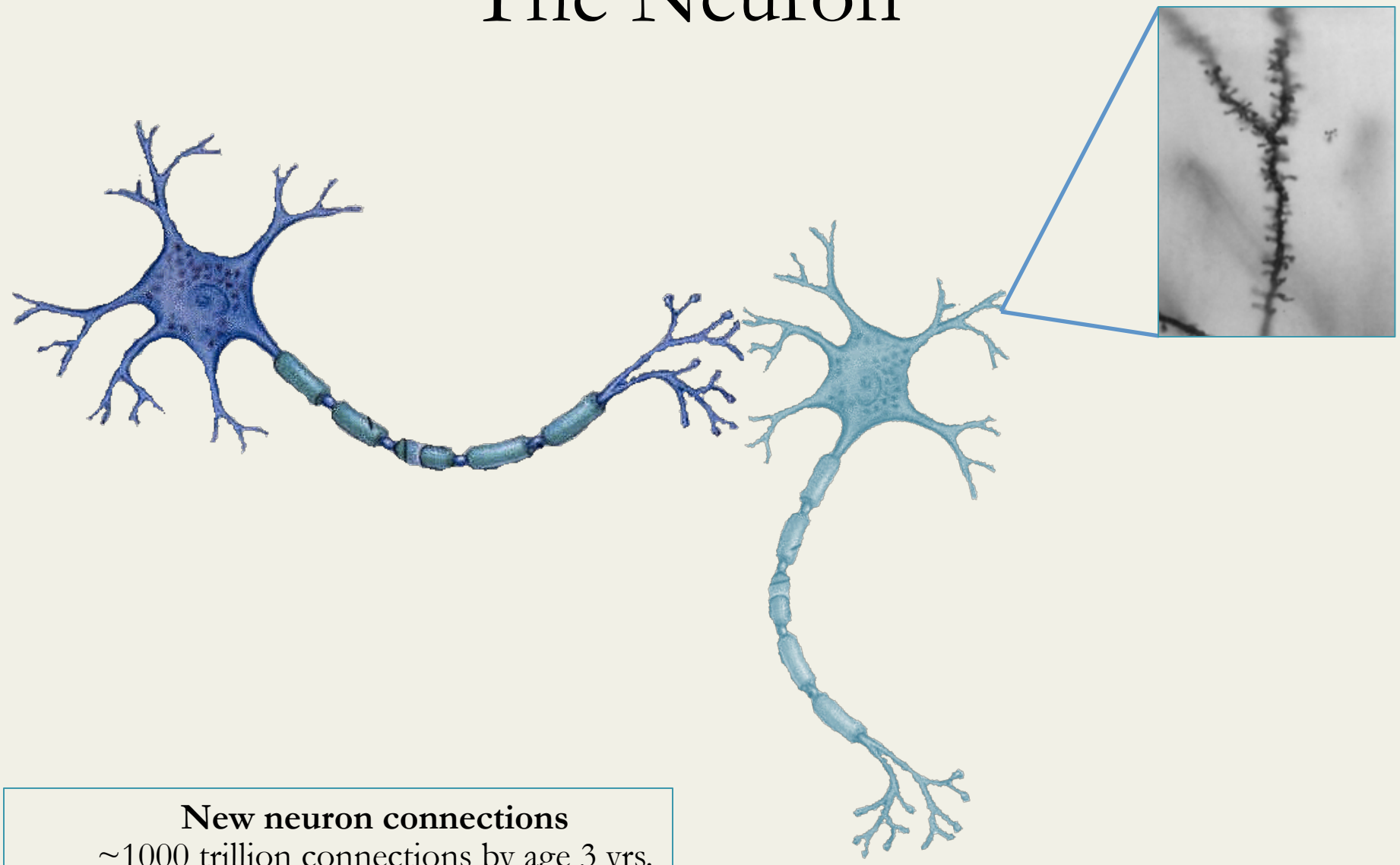
- Reflect on what aspects of brain research we might bring to our work with children and families.

Brain Growth

Age	Brain Weight (g)
20 weeks gestation	100
Birth	400
18 months	800
3 years	1100
Adult	1300-1400

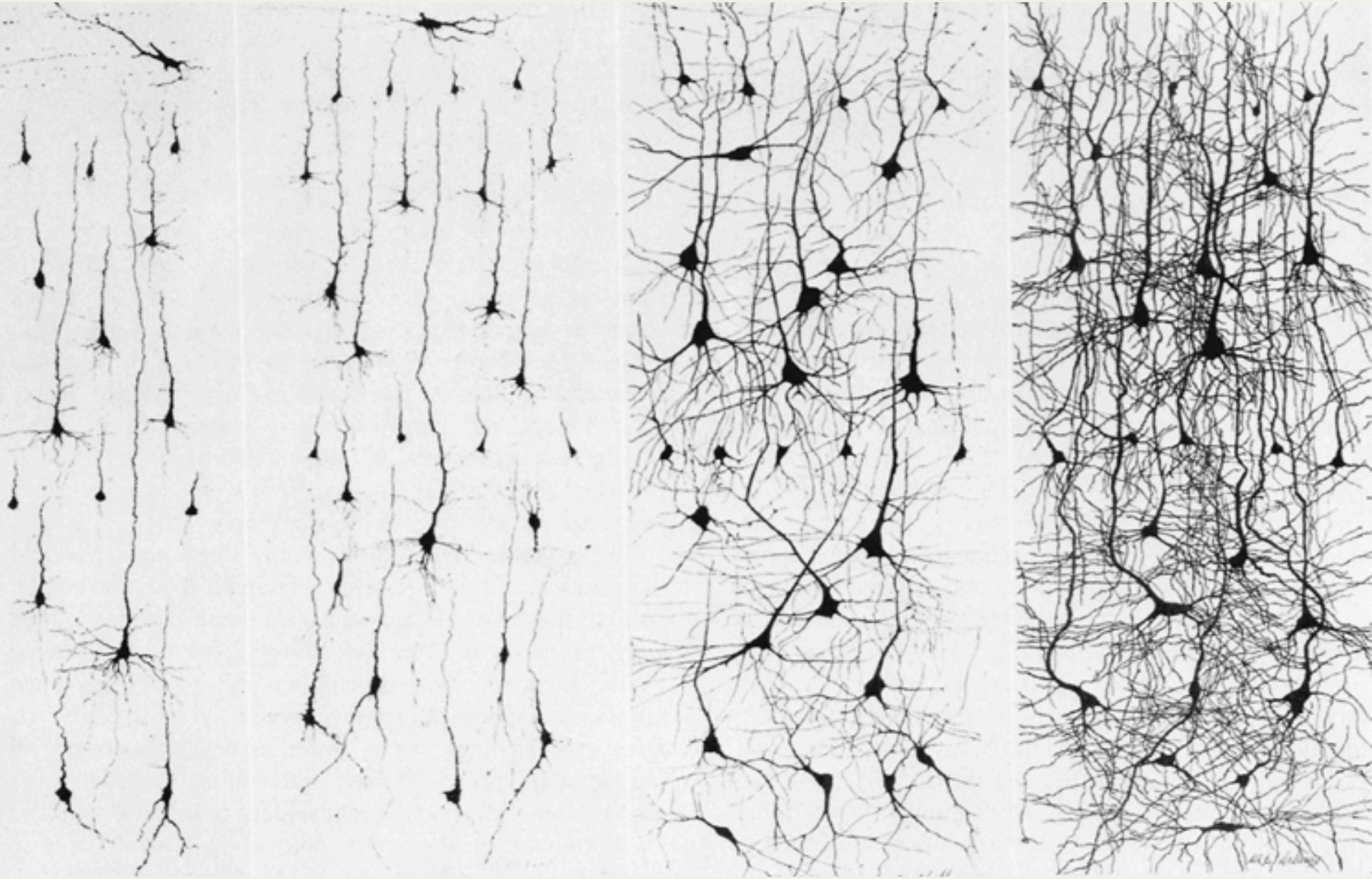
In some stage of development, the brain is adding 250,000 – 500,000 new neurons (brain cells) per minute

The Neuron



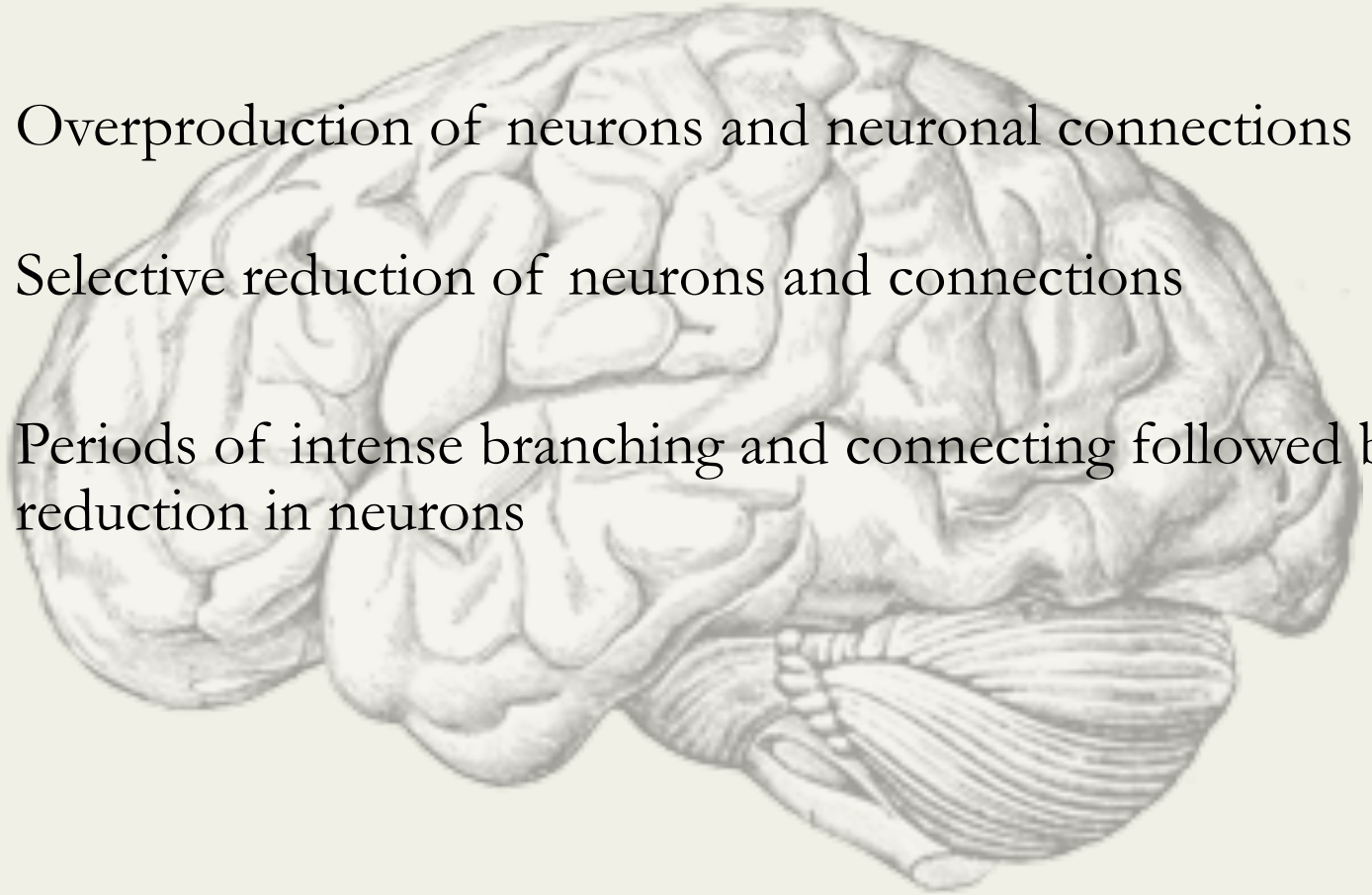
New neuron connections
~1000 trillion connections by age 3 yrs.

Brain Development – Synapse Formation



Birth 1 month 6 months 24 months

How Does the Developing Brain Become Aware, Learn, Think,?



- Overproduction of neurons and neuronal connections
- Selective reduction of neurons and connections
- Periods of intense branching and connecting followed by reduction in neurons

Brain Development – Synaptic Pruning

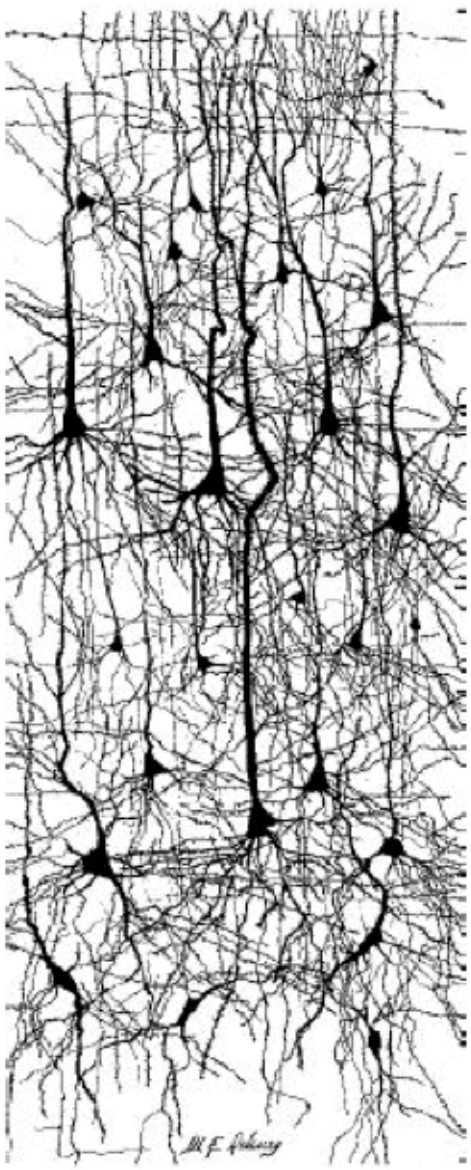


Fig. 92. Drawings from Golgi-Cox preparations

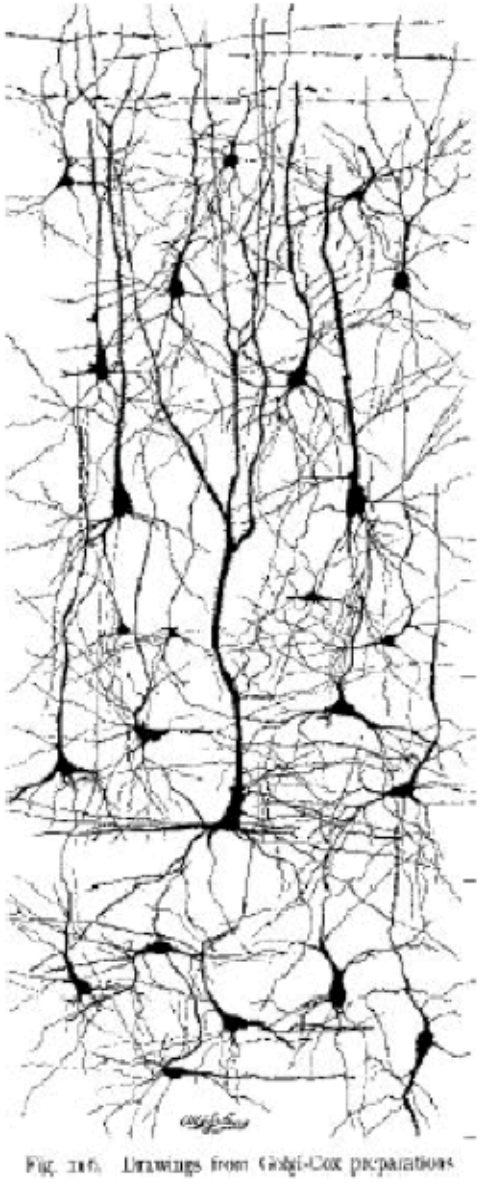


Fig. 116. Drawings from Golgi-Cox preparations

2 years

6 years

Experience-Based Brain Plasticity

- Genes and environment interact throughout brain development
  - Genes form neurons, connections among major brain regions
  - Environment and experience refines the connections; enhancing some connections while eliminating others

- Brain development is activity/experience-dependent

- Neural circuits used over and over strengthen, those that are not used are dropped resulting in "synaptic pruning"

Neglect and Brain Development

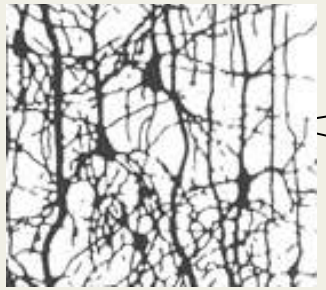
- Limited exposure to language, touch or social interactions
- Emotional or cognitive neglect
- Early life stress

Structural Changes in the Brain

  - Lack of brain growth beyond effects of poor nutrition
  - Neuronal death beyond "pruning"

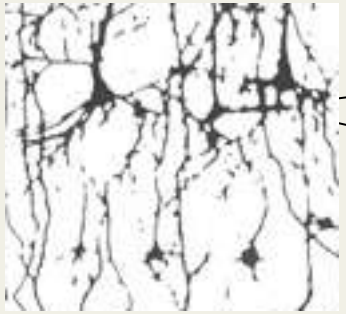
Persistent Adversity Changes Brain Architecture

Normal



Typical - neuron with many connections

Chronic stress

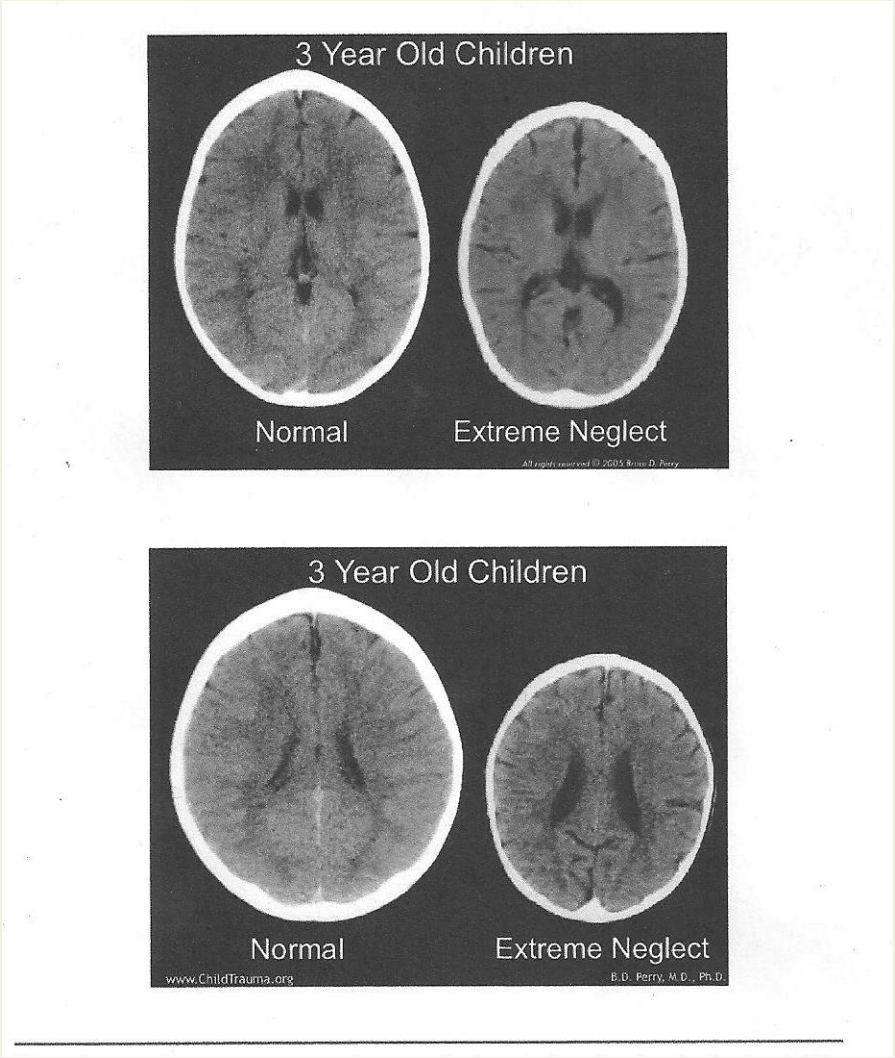


Neuron damaged by toxic stress – fewer connections

Prefrontal Cortex and Hippocampus

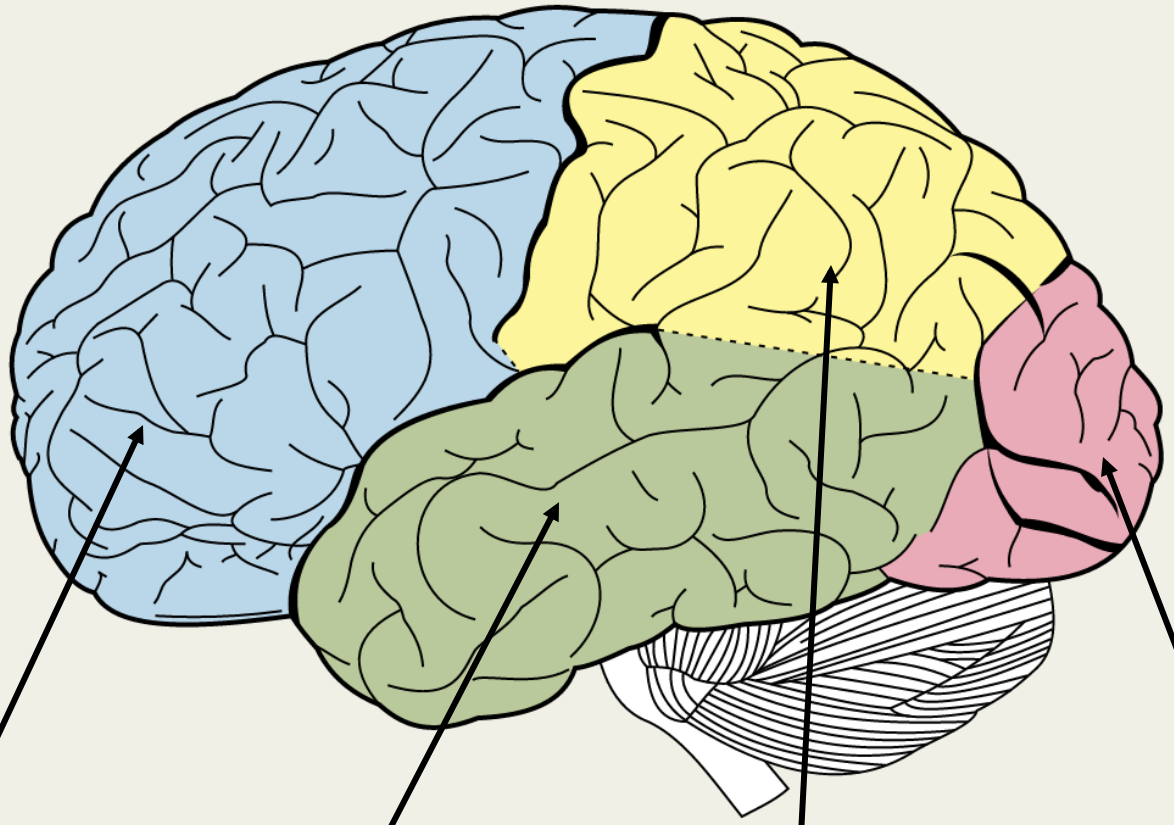
Source: C. Nelson (2008)

Persistent Adversity Changes Brain Architecture



Brain scans from the Child Trauma Academy - Dr. Bruce Perry

Major Areas of the Brain



Self-regulation, problem solving, goal setting, social cognition

Hearing, language, memory, social - emotional function

Sensory motor perception
Spatial abilities

Vision and perception

How Brain Areas are Developing

Anatomical studies of brain development show

- Occipital lobes show earliest pruning
- Frontal and Temporal lobes show growth of neural connections and pruning longer than other areas of
  * Greatest change between 2 years and 5 years
  * Frontal lobes continue until adolescence

How Brain Function is Developing

- Brain areas with longest periods of organization:
  - self-regulation
  - problem-solving
  - language/communication
  - social bonding

- Most dynamic growth, pruning, connecting, and activity occurs between *1-1/2 years through 3 or 4 years old*

- Research in neuroscience suggests that *this may be one of the most important periods* for developing self-regulation, problem-solving, social-emotional, and language/communication behaviors

What early experiences promote healthy brain development?

- Important areas of brain development are associated with…
  - Self-control or Self-regulation
  - Language/communication
  - Learning
  - Social emotional function
- Research shows that everyday experiences with caregivers or other children can optimize the development in these areas

Key Process Element

- Early experiences create brain neuron connections
- Parent-child interactions are key

Healthy brain development requires consistent and nurturing relationships

These relationships shape emotional growth, self-regulations and social competence

Positive early relationships buffer stress

"Healthy brain connections depend on healthy human connections"

Impact of Attachment

Your attachment style affects how you live your life in many ways

ATTACHMENT STYLES

Secure Attachment – You feel secure in relationships. You can function on your own but like to lean in for support when under stress . You preserve relationships by seeking connection and negotiating the needs of you and your partner.

Avoidant Attachment – You feel safer being independent. You have learned to manage your distress on your own. You try not to be a bother or make emotional demands on your loved ones. You try to preserve relationships by keeping emotional needs to yourself..

Ambivalent Attachment - You feel safer being dependent. You have learned to manage your distress by protesting and making a fuss. You try to preserve relationships by provoking fights and then making up.

Disorganized Attachment - You feel anxious and insecure in relationships This may be due to past abuse, neglect or trauma. When you feel threatened or misunderstood, you have inconsistent ways of protecting yourself. You may shut off your feelings. Or you may seek comfort then reject it.

In the last 10 years attachment theory has become the most complex theory of the development of the brain/mind/body available to science.

Allan Schore, 2011

A Framework for 'Building Brains'

1. Create a loving connection
2. Be a secure base
3. Accept feelings
4. Set limits with love
5. Have "baby conversations"

Create a Loving Connection

Child

Child needs a 'secure attachment"

an emotional bond between parent and child in which the child is unconditionally loved and protected.

Happens when primary caregiver responds calmly, warmly and consistently

Parent's can:

Talk affectionately to their child.

Touch child in a gentle way

Give their child undivided attention

Laugh and play together

Respond with sensitivity and comfort especially when their child is sick, hurt or upset

The Attachment Cycle

Child Distressed

- Increased heartrate, breathing
- Feels enraged, helpless, hopeless

Carer Soothes Child

Physical contact, food, dry pants, comfort.

Child Content/Asleep

Child Learns

- Caregiver = Comfort
- The world is a good place
- I can trust people to meet my needs
- My needs make sense

Debbie Jeffrey (2008) A paper presented to the Australian Adoption Conference, Sydney, Australia

Disrupted Attachment

Child Distressed

- Increased heartrate, breathing
- Feels enraged, helpless, hopeless

No Comfort

Caregiver doesn't come, or doesn't acknowledge or attend to child's need

Child Distressed

-Increased heartrate, breathing
-Enraged, helpless, hopeless

Child Learns

- Caregivers are untrustworthy
-The world is a hard place
- No-one can meet my needs
- My needs don't make sense

Debbie Jeffrey (2008) A paper presented to the Australian Adoption Conference, Sydney, Australia

Be a Secure Base

Child

This helps them….

Feel secure inside themselves

Seek comfort when needed

Handle the ups and downs of life

Feel curious and confident to explore the world,

Parent's can

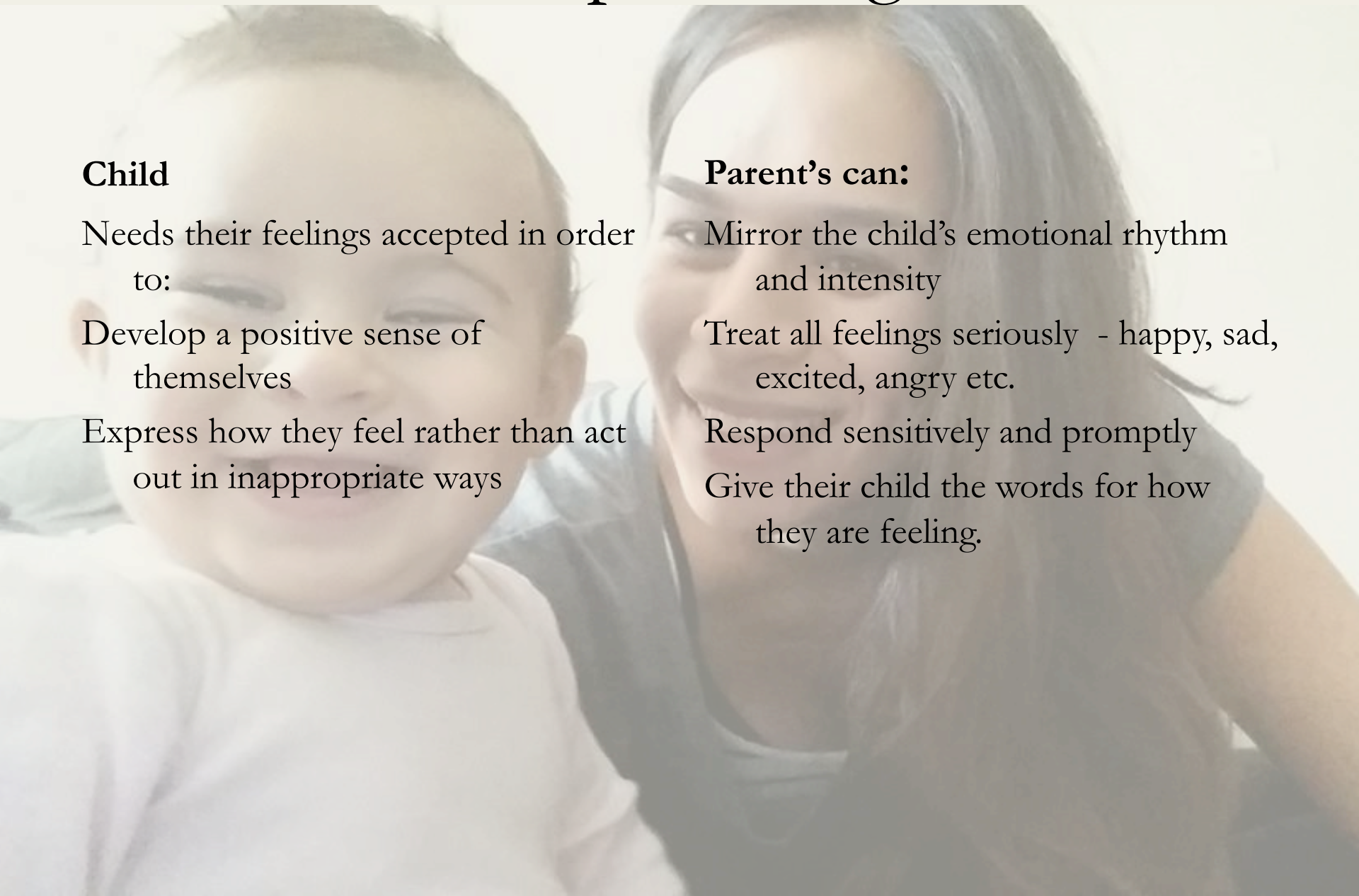
Respond consistently to their child's request for attention, comfort and exploration

Watch over their child while they explore

Welcome their child back when she wants to be close

Provide predictable daily routines and special family rituals.

Accept Feelings



Child

Needs their feelings accepted in order to:

Develop a positive sense of themselves

Express how they feel rather than act out in inappropriate ways

Parent's can:

Mirror the child's emotional rhythm and intensity

Treat all feelings seriously - happy, sad, excited, angry etc.

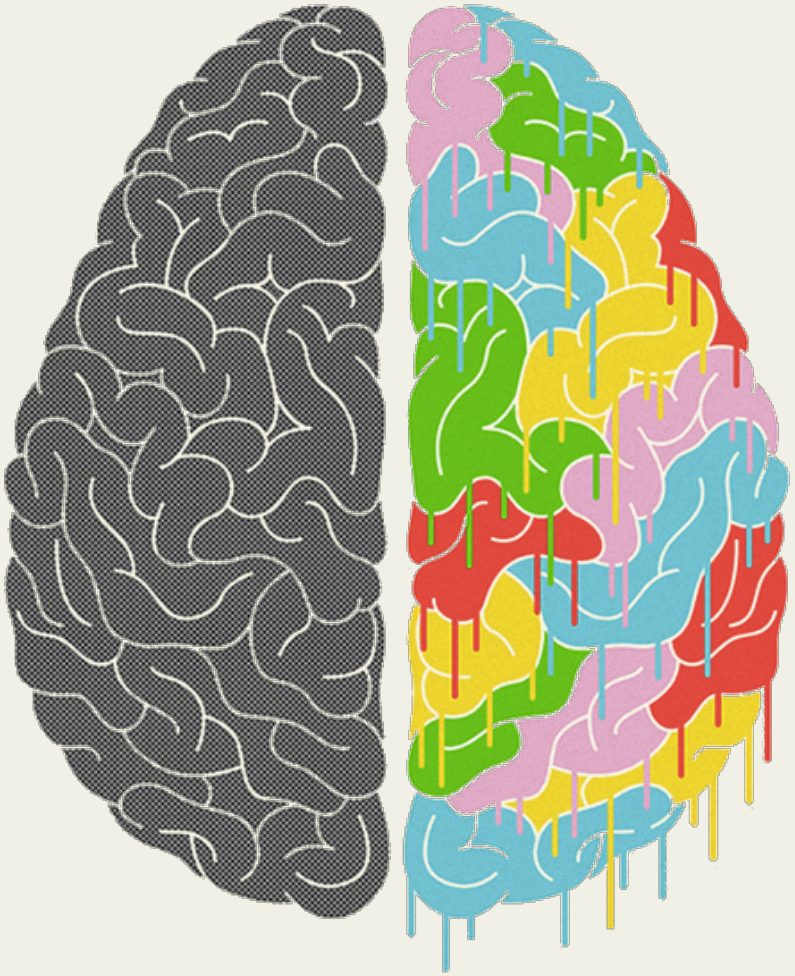
Respond sensitively and promptly

Give their child the words for how they are feeling.

Left Mind – Right Mind

language production

language comprehension



non- linguistic components of language

emotional communication

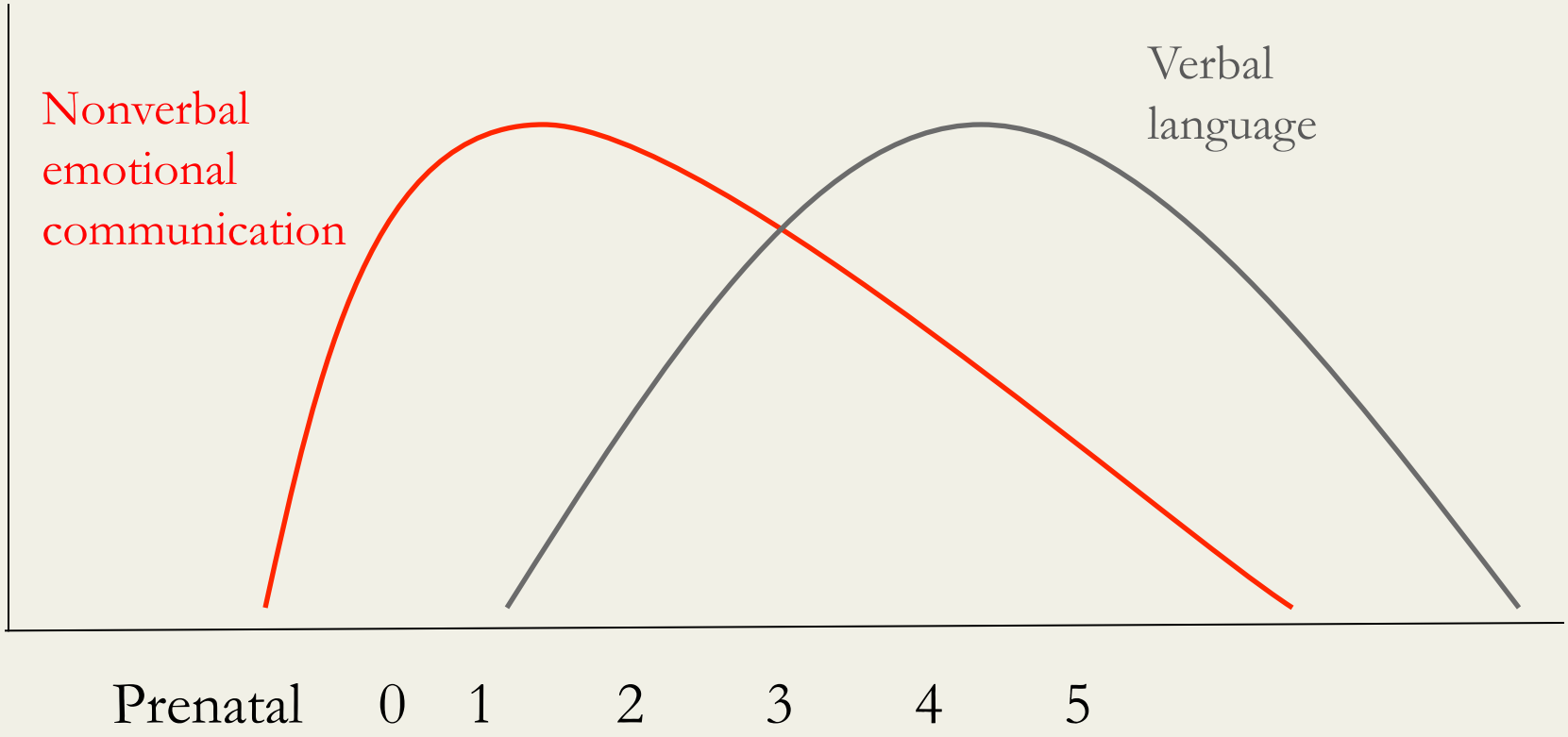
emotional comprehension

prosody

facial expressions

Human Brain Development

right brain dominates for first three years



Ruth P. Newton 2008

"One of the most powerful coping tools you can give your child is giving her permission to express her negative feelings"

Stanley Greenspan

Setting Limits with Love

Child

Develop self-control – also known as self-regulation

Avoid hurting themselves or others

Learn what is expected within their family and community

Parents can:

Establish routines in the home when their baby is young

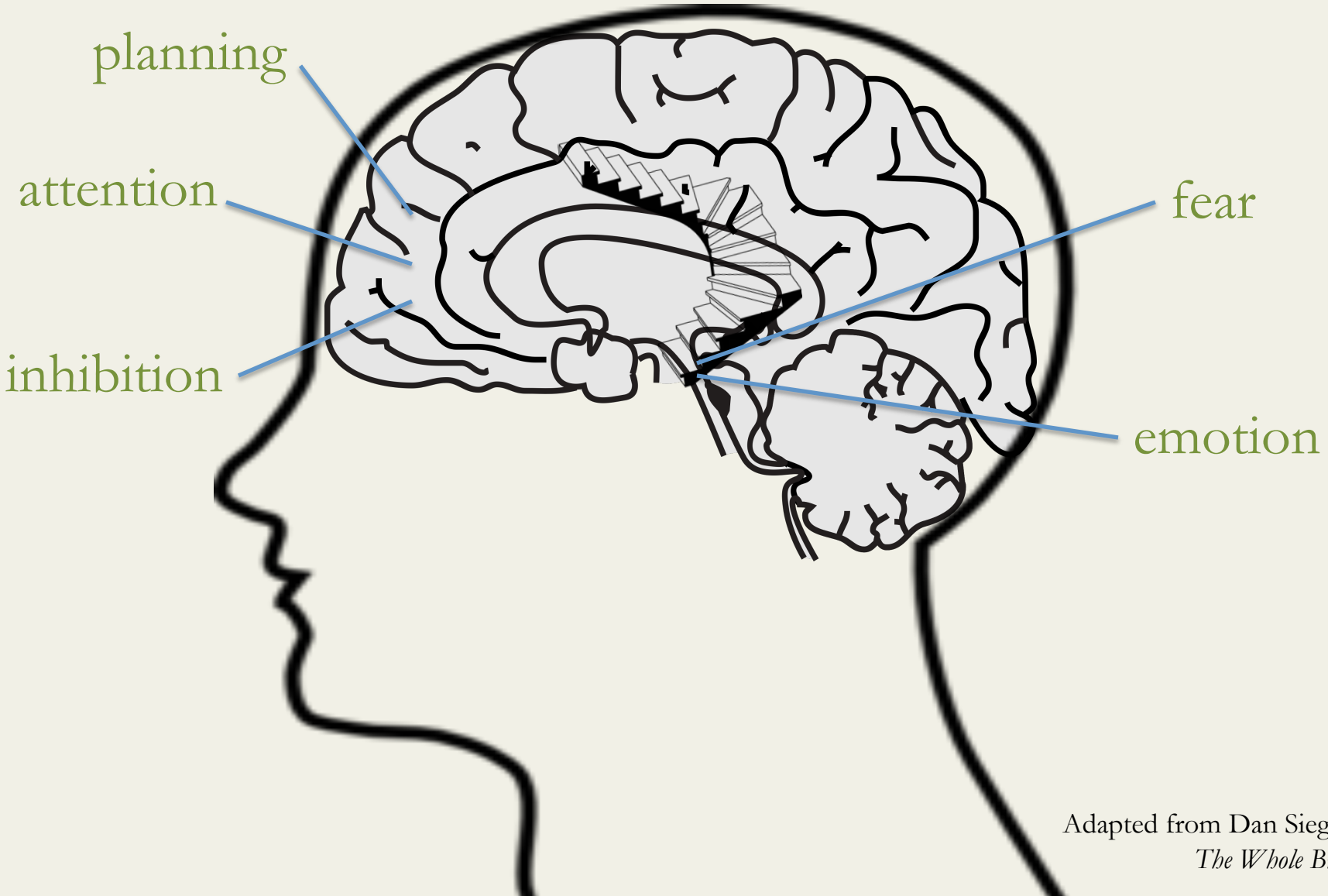
Approach limit-setting as an opportunity to 'teach' not punishment

Find ways to say yes more often than no

Say no in a calm respectful way

Setting Limits with Love

promotes 'upstairs-downstairs' brain integration



Adapted from Dan Siegel (2011)
The Whole Brain Child

Have 'Baby Conversations'

Child

Connect with people around them

Express their needs, interests and feelings

Control their behavior and emotions

Learn about their world

Parents can

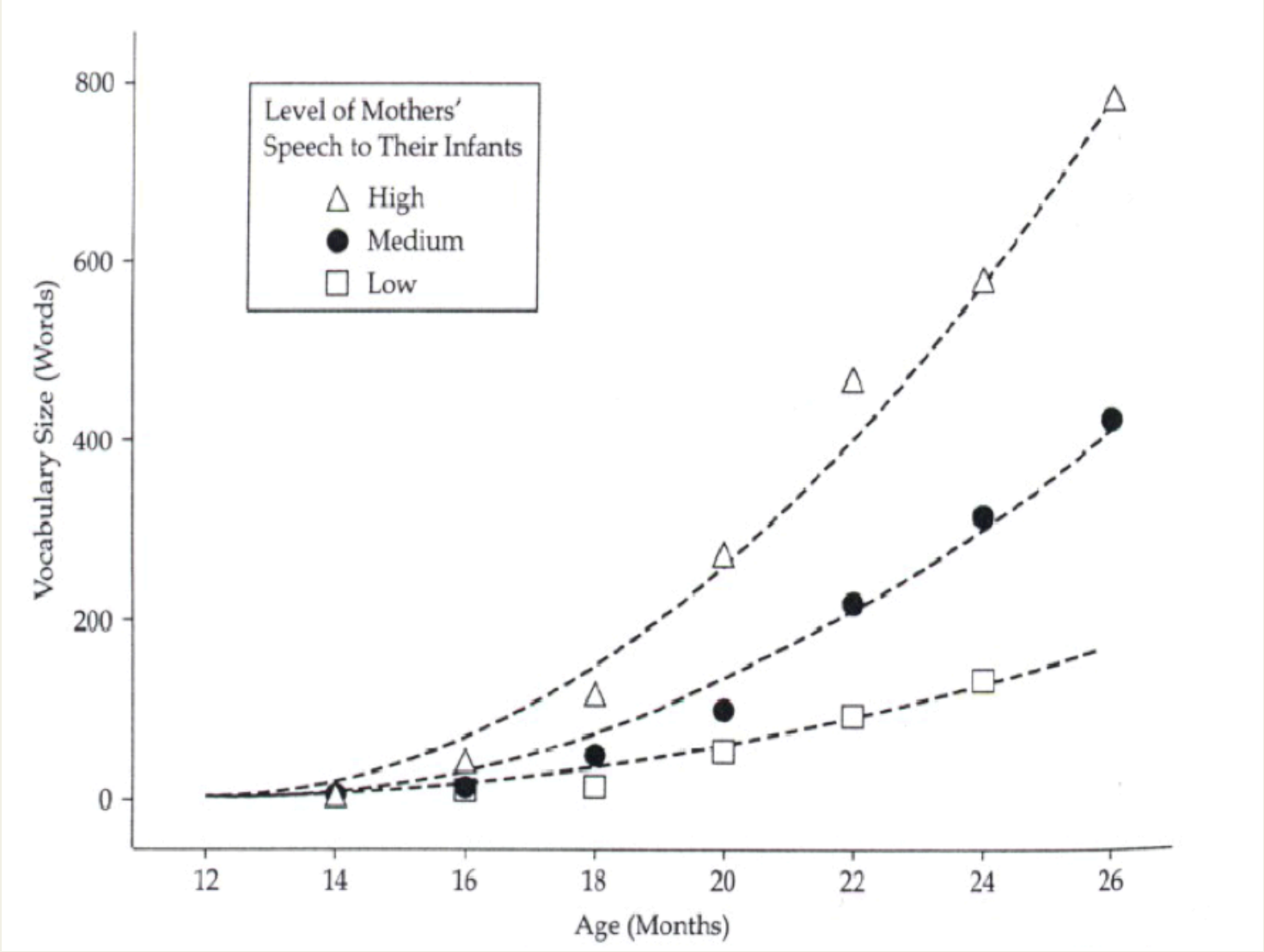
Talk in response to their child's interests and feelings

Use an expressive voice and gestures

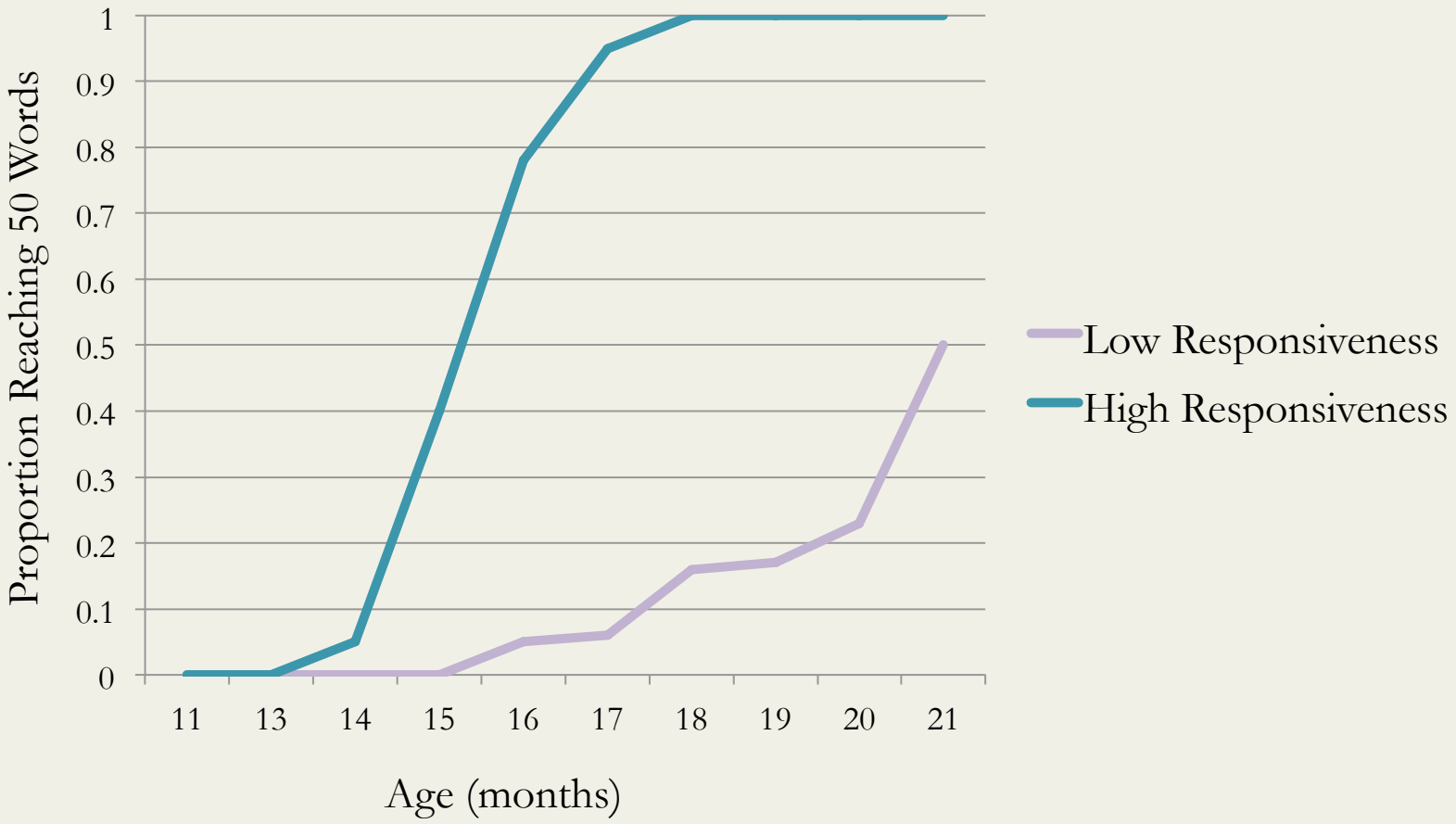
Name things their child shows interest in

Expand on their child's words and ideas

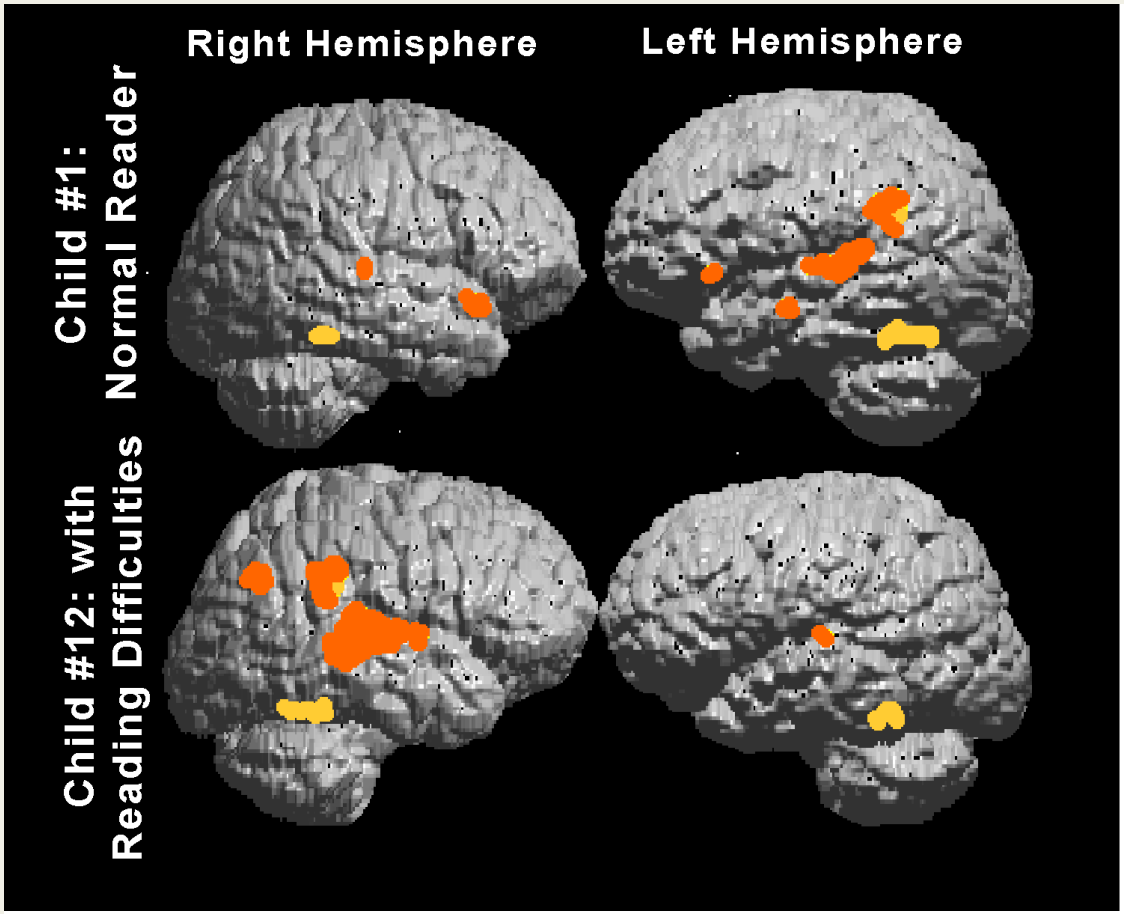
Effects of Mother's Speech on Infant Vocabulary



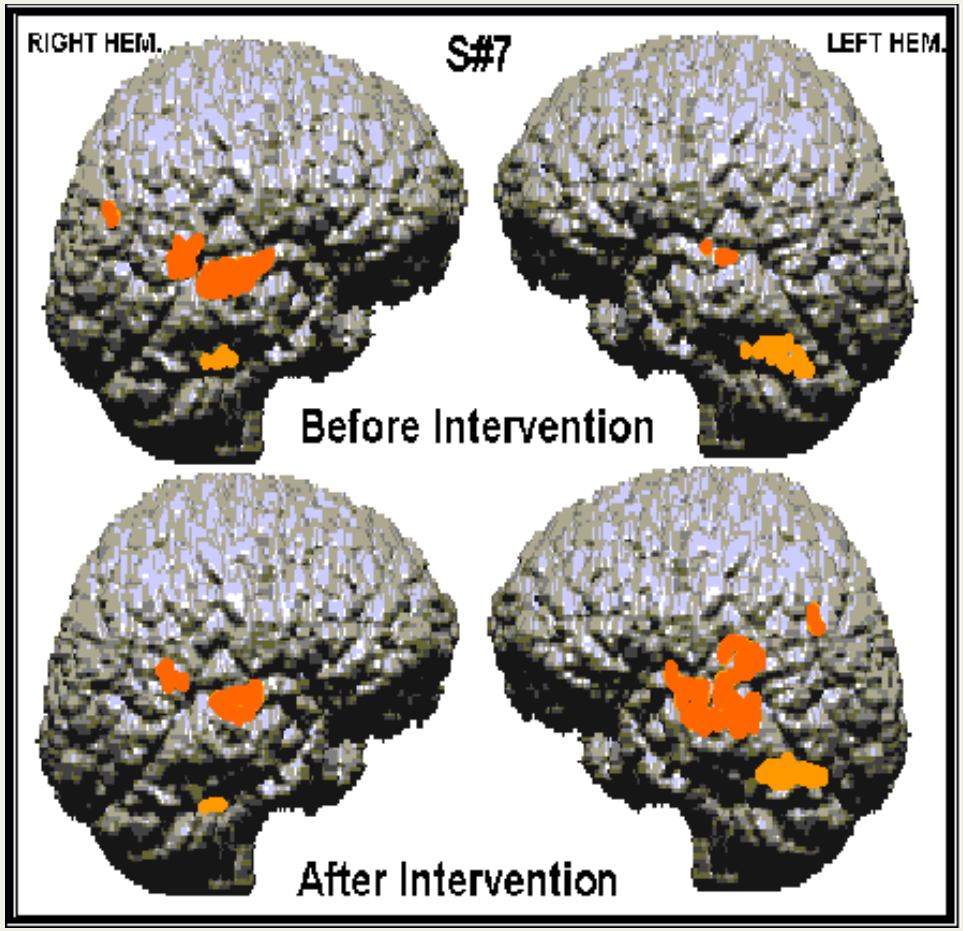
Parenting and Word Acquisition



Differences in brain activity between a typical child reader and a child with reading difficulties



Differences in brain activity in the same child before and after specialized reading instruction



Conclusion

- We now know more about the early developmental period and its affect on child outcome

- Research in brain development supports the notion that a health early parent-child relationship support better brain development

"Healthy brain connection depend on healthy human connections"

- With the development of new functional neural techniques allowing us to see the infant brain in action will help better inform us on the structural and functional changes in a child's brain during these parenting interventions

Thank-you

Claire Watson
craft@sympatico.ca

Emis Akbari
emisakbari@gmail.com

THE PSYCHOLOGY FOUNDATION OF CANADA
LA FONDATION DE PSYCHOLOGIE DU CANADA

UNIVERSITY OF TORONTO
OISE | ONTARIO INSTITUTE FOR STUDIES IN EDUCATION