

**Integrating Principles of
Neurodevelopment into Clinical
Practice**
 Introduction to the Neurosequential Model of
Therapeutics (NMT)

 2011

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Theory of Change

 Why do you do the things you do?
 How do you think they will cause
change for the client – for your child?

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NMT Core Principles

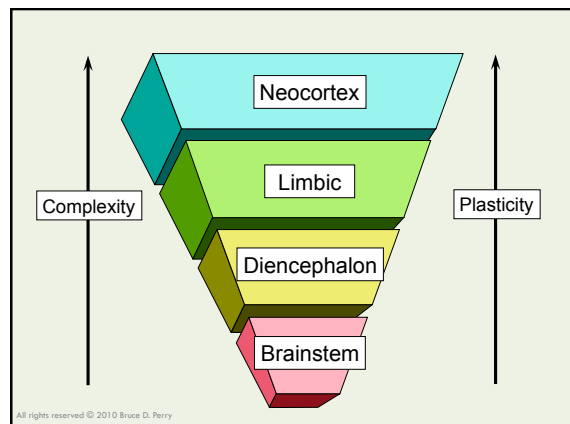
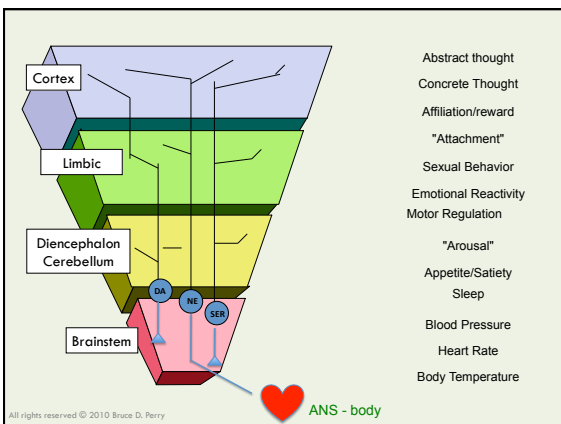
 A. Brain Organization and Function

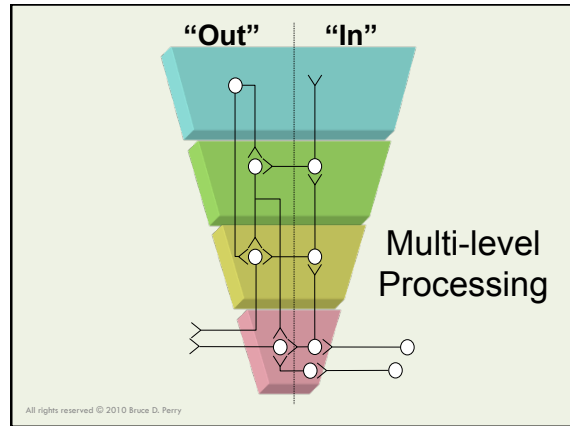
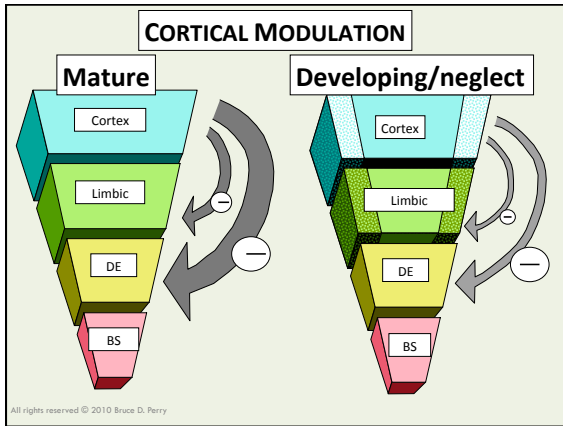
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The Brain Matters

- The human brain is the organ responsible for everything we do. It allows us to love, laugh, walk, talk, create or hate.
- The brain - one hundred billion nerve cells in a complex net of continuous activity - allows us our humanity.
- For each of us, our brain's functioning is a reflection of our experiences.

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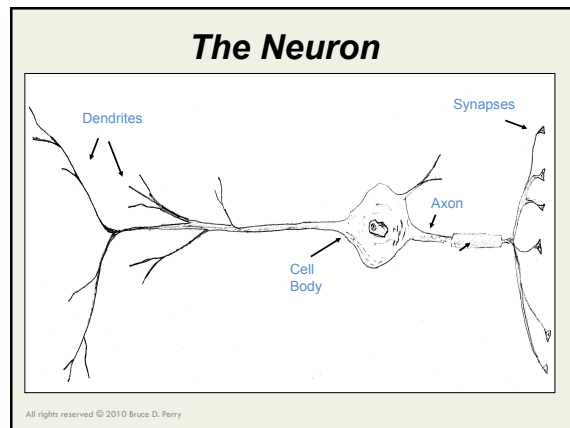




NMT Core Principles

B. Neurodevelopment and Memory

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The Brain Develops

The human brain, with all of its complex structure and function, does not just "pop" into existence.

In the 9 months following conception, 100 billion neurons and 10 trillion glial cells are born. These cells organize, move, connect and specialize to create the amazing and functioning brain of the newborn.

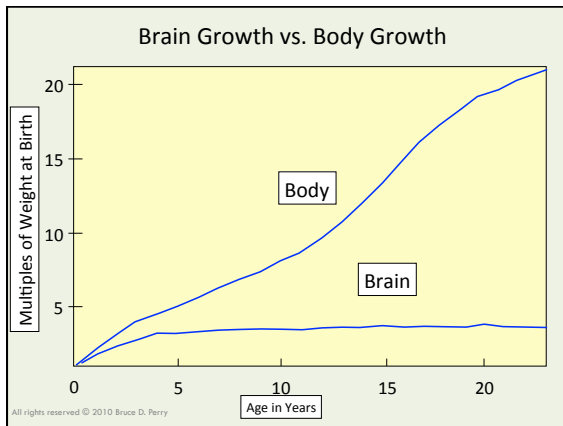
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USE-DEPENDENT DEVELOPMENT

The more a neural system is "activated," the more that system changes to reflect that pattern of activation

This is the basis for development, memory and learning

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Sequential Neurodevelopment

- The brain is undeveloped at birth
 - The brain organizes from the “bottom” up - brainstem to cortex and from the inside out
 - Organization and functional capacity of neural systems is sequential
 - Experiences do not have equal “valence” throughout development
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What is Memory ?

- The capacity to bring elements of an experience from one moment in time to another.
 - This is the unique property of life forms.
 - There are many ways that life forms do this - genes, immune system, nervous system
 - Nervous tissue is designed to store elements of experience.
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Association

- The brain makes associations between sensory signals co-occurring in any given moment in time
 - This capacity allows humans to learn, create images of the future and survive.
 - This capacity can also make humans vulnerable to false associations - creating fears of non-threatening objects.
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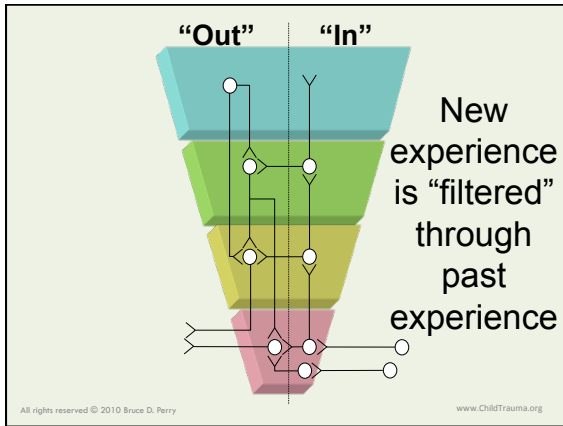
Creating First Memories

The first set of unique sensory stimuli shape neural “networks” which will “encode” and store – in neurons – the template for future sensory stimuli similar to this original sensory experience.

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Neuroarcheology

- The age at which an adverse event takes place will influence the neurodevelopmental impact and the resulting functional consequences
 - Therefore, developmental history of adverse experiences is crucial to understanding current functioning
 - NMT includes a developmental review of adverse experiences AND the buffering effects of relational health
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NMT Core Principles

C. Relational Neurobiology and Attachment

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Human beings are social creatures.

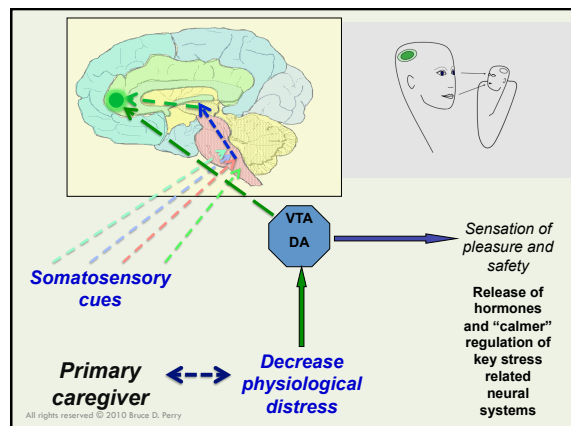
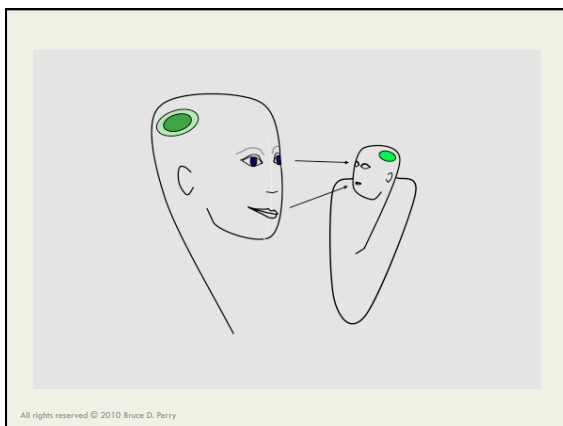
The neural systems which mediate social interaction, communication, empathy and the capacity to bond with others are all shaped by the nature, quantity and timing of early life relationships.

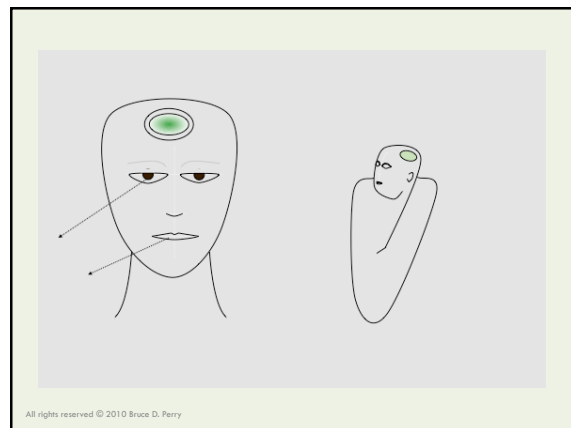
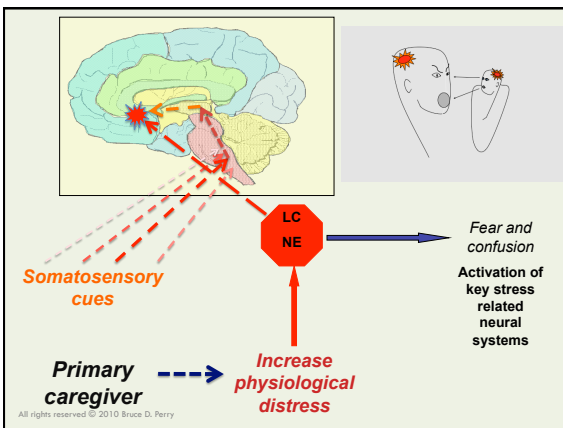
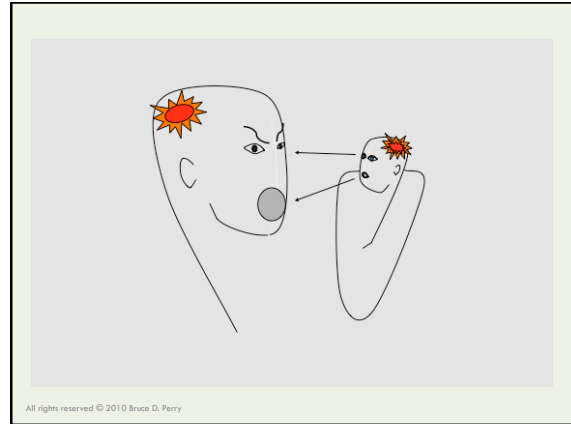
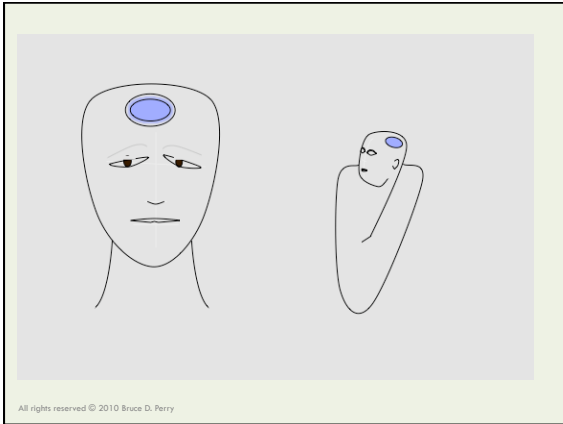
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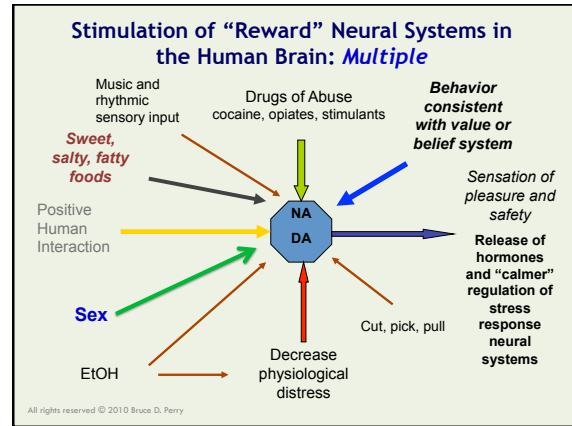
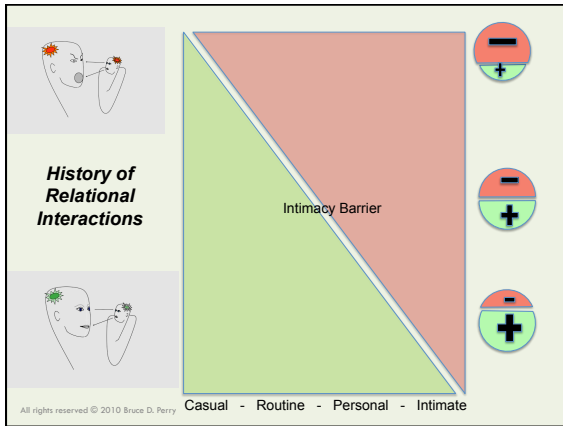
Relational Neurobiology
Foundational Neural Systems

The neural systems mediating the stress-response, reward, procreation, reproduction, social-affiliation and communication are all inter-related - indeed, they often share the very same fundamental neurotransmitter networks and brain regions.

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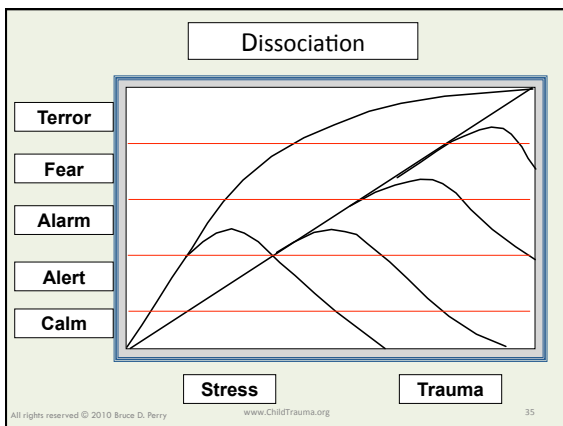


NMT Core Principles

D. Stress, Distress and Trauma

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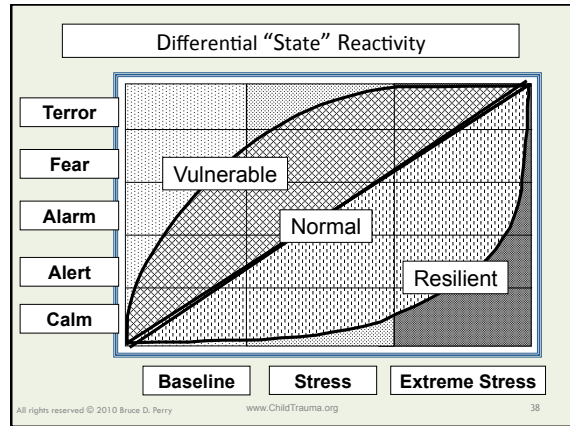
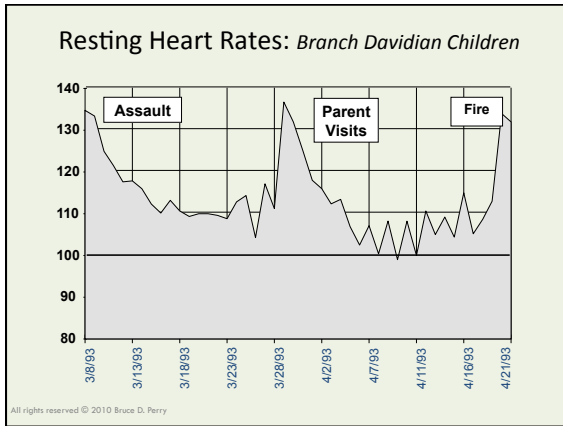
- Responses to Stress, Distress, Trauma**
- **Heterogeneity of response patterns**
 - Adaptive changes in *cognition*
 - Adaptive changes in *affects*
 - Adaptive changes in *behavior*
 - Adaptive changes in *neurophysiology*
 - Adaptive changes in *physiology*
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DISSOCIATIVE/AROUSAL BALANCE

| | | | |
|--------------------------|---|--------------------|--|
| Dissociation | | Arousal | |
| Females | > | Males | |
| Young Children | > | Older Children | |
| Torture/Pain | > | Observer | |
| Inescapable Helplessness | > | Action Active Role | |

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| | | | | | |
|--------------------------------------|-------------------------------|----------------------------|---------------------------|------------------------------|-------------------------------|
| Sense of Time | Extended Future | Days Hours | Hours Minutes | Minutes Seconds | Loss of Sense of Time |
| Primary secondary Brain Areas | NEOCORTEX <i>Subcortex</i> | SUBCORTEX <i>Limbic</i> | LIMBIC <i>Midbrain</i> | MIDBRAIN <i>Brainstem</i> | BRAINSTEM <i>Autonomic</i> |
| Cognition | Abstract | Concrete | "Emotional" | Reactive | Reflexive |
| Mental State | CALM | ALERT | ALARM | FEAR | TERROR |

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NMT Core Principles

E. Neglect

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To neglect a child is to murder them.

Daniel Dafoe

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A Neurodevelopmental Definition of Neglect

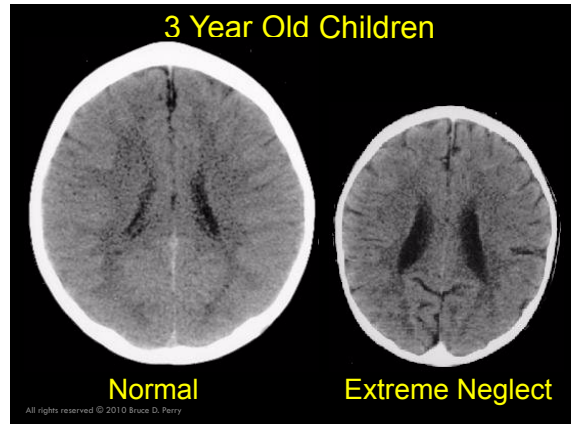
- Lack of a specific pattern of experience during development results in abnormal development of a core brain function
- The abnormal development is in those brain systems which *sense, perceive, process, "interpret", and "act on"* information related to that specific experience or input.

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Multiple Forms of Neglect

| <u>DOMAINS</u> | <u>PATTERN</u> |
|----------------|----------------|
| Emotional | Episodic |
| Social | Chaotic |
| Cognitive | Total global |
| Motor | |

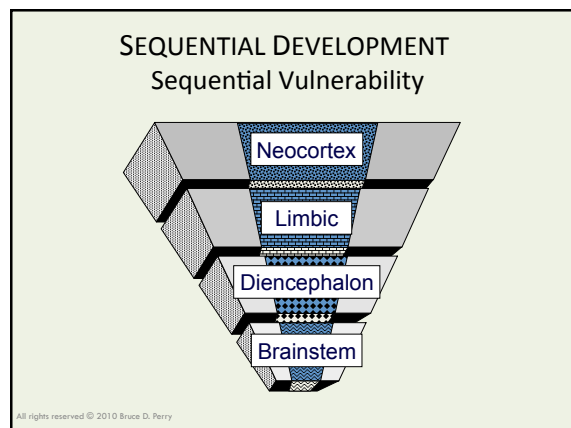
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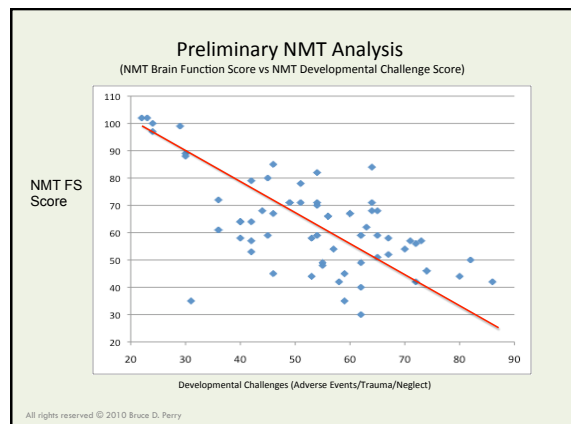
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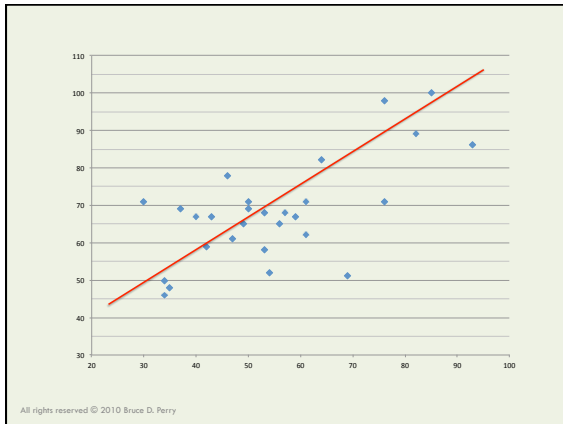
F. Neurosequential Model of Therapeutics

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- ## Neurodevelopmental Risk
- The NMT process involves assessing the timing, nature and intensity of adverse events
 - The timing, nature and quality of “buffering” relational health is assessed as well
 - An estimate of “developmental risk” is obtained at various times during development by combining the AE and RH scores
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Current Relational Health

- A major factor in healing appears to be the nature, quality, intensity and stability of a person’s relationships
- The NMT assessment process includes a simple metric that looks at current relational health
- The score on this metric is a key indicator of outcome – good relational stability predicts positive outcome – and poor relational health predicts poor outcomes

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NMT Brain Mapping Process

- The key indicator of brain organization and neurophysiological status is function
- By creating a simplified construct – the brain map – assessment of key brain-mediated functions can help “localize” neurodevelopmental vulnerabilities and strengths
- This “localization” helps direct developmentally-sensitive interventions

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CNS Functional Map

- Several “brain map” models have been used in the process of creating and refining the NMT
- Current mapping process involves a web-based menu-driven review of various brain-mediated functions
- The resulting “map” creates a visual representation that is useful for teaching, treatment planning and tracking outcomes

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Difficult to sooth: Birth

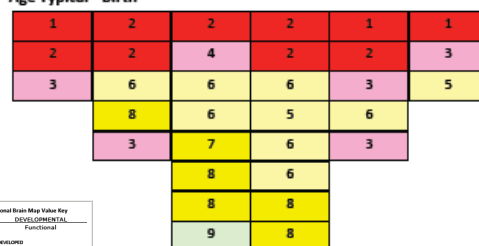


Functional Brain Map Value Key

| DEVELOPMENTAL | |
|---------------|----------------------|
| Functional | |
| 11 | HEALTHY |
| 10 | TYPICAL ABUSE |
| 9 | SPROCK/PUNISHING |
| 8 | MILD COMPRESSIVE |
| 7 | PROXIMAL CAPACITY |
| 6 | MODERATE DYSFUNCTION |
| 5 | UNDEVELOPED |
| 4 | UNDEVELOPED |
| 3 | SEVERE DYSFUNCTION |
| 2 | SEVERE DYSFUNCTION |
| 1 | SEVERE DYSFUNCTION |

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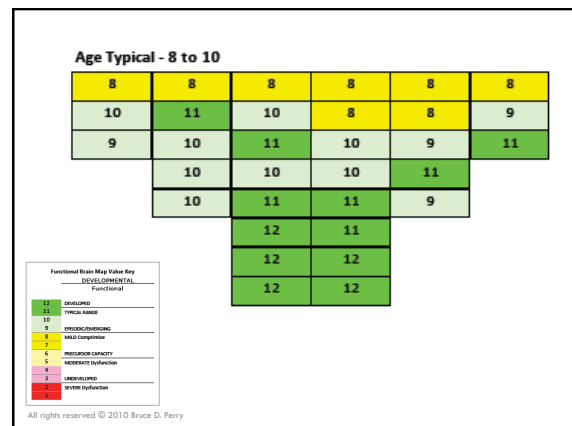
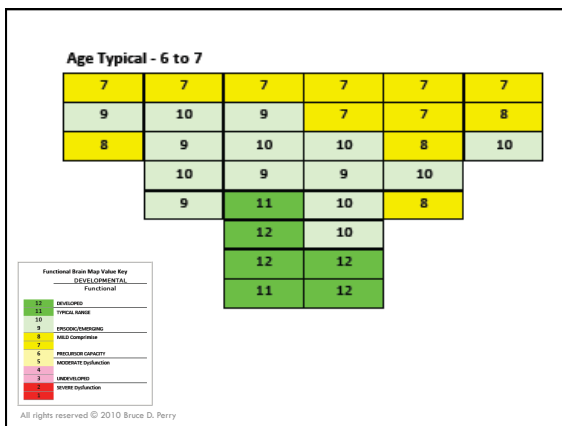
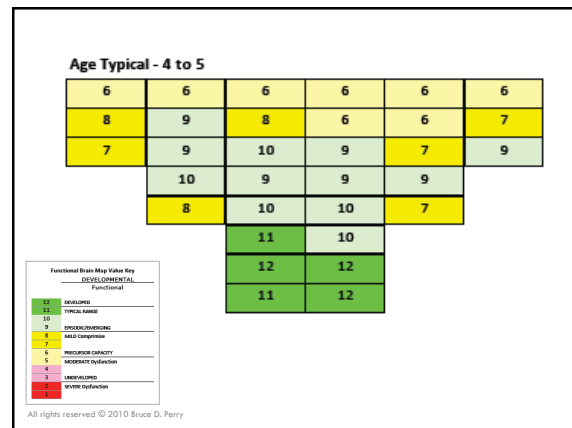
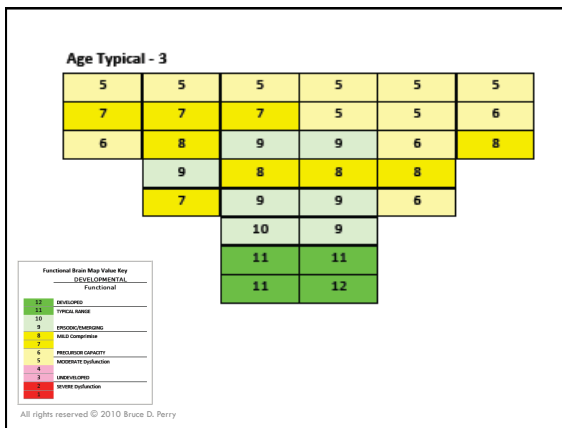
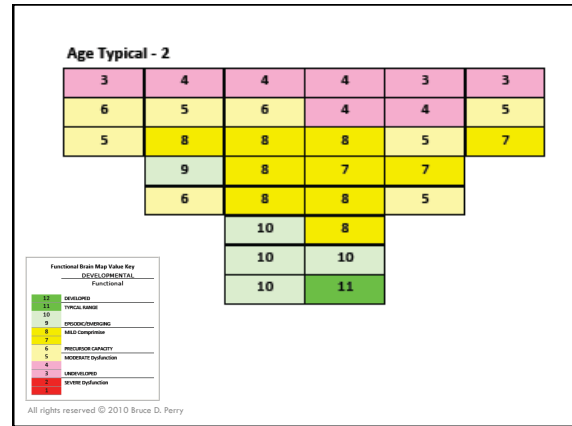
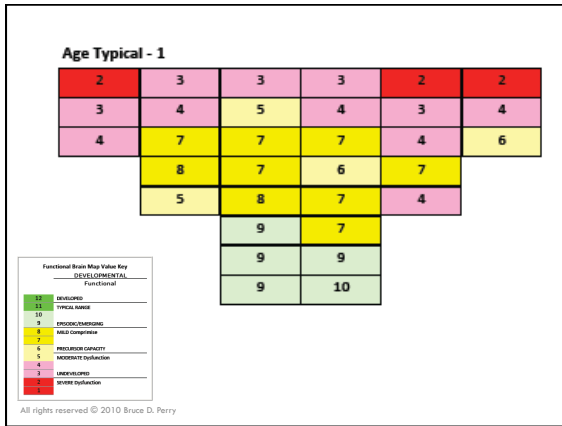
Age Typical - Birth

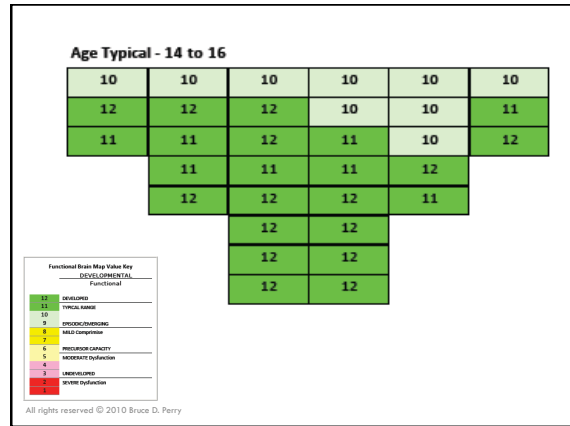
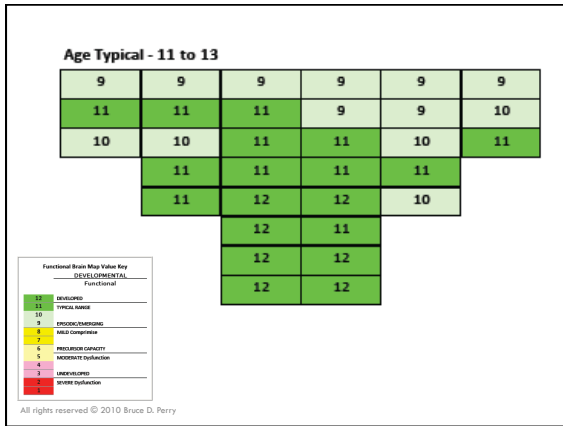


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| 2 | SEVERE DYSFUNCTION |
| 1 | SEVERE DYSFUNCTION |

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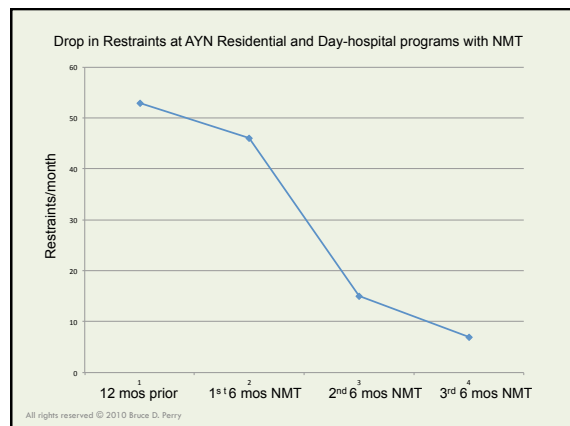
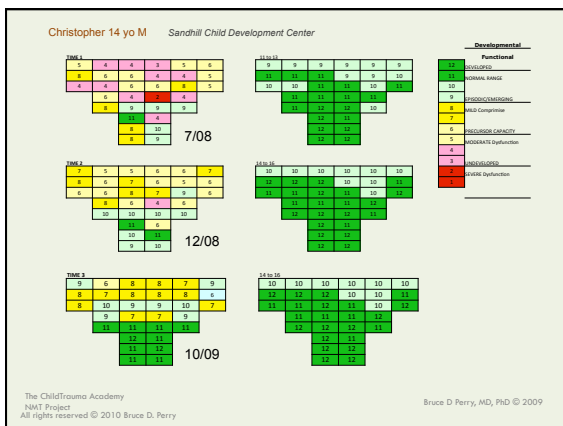


NMT Core Principles

G. NMT Application and Outcomes

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- Core elements of positive developmental, educational and therapeutic experiences
- Relational (safe)
 - Relevant (developmentally-matched)
 - Repetitive (patterned)
 - Rewarding (pleasurable)
 - Rhythmic (resonant with neural patterns)
 - Respectful (child, family, culture)
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NMT Core Principles

H. Current NMT Metric Reports

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Client (5 years, 11 months) Report Date: 7/25/2010

| | | | | | |
|---|----|----|----|---|---|
| 2 | 3 | 3 | 2 | 3 | 2 |
| 1 | 2 | 5 | 3 | 2 | 7 |
| 4 | 4 | 6 | 4 | 2 | 8 |
| 4 | 3 | 4 | 3 | | |
| 9 | 4 | 5 | 11 | | |
| | 10 | 6 | | | |
| | 10 | 10 | | | |
| | 9 | 10 | | | |

Age Typical - 4 to 5

| | | | | | |
|---|----|----|----|---|---|
| 6 | 6 | 6 | 6 | 6 | 6 |
| 8 | 9 | 8 | 6 | 6 | 7 |
| 7 | 9 | 10 | 9 | 7 | 9 |
| | 10 | 9 | 9 | 9 | |
| | 8 | 10 | 10 | 7 | |
| | | 11 | 10 | | |
| | | 12 | 12 | | |
| | | 11 | 12 | | |

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M.; 6 yo M

Hx intrauterine SA/ EtOH; severe neglect and abuse; removed at 12 mos; multiple placements; adopted at age 2

Dx at time of eval: ODD, ADHD

Client (6 years, 0 months) Report Date: 11/24/2010

| | | | | | |
|---|---|----|----|---|---|
| 4 | 6 | 6 | 2 | 6 | 6 |
| 7 | 9 | 6 | 3 | 6 | 8 |
| 4 | 4 | 5 | 4 | 6 | 8 |
| | 8 | 4 | 2 | 8 | |
| | 7 | 9 | 7 | 6 | |
| | | 10 | 3 | | |
| | | 10 | 9 | | |
| | | 7 | 10 | | |

Age Typical - 6 to 7

| | | | | | |
|---|----|----|----|----|----|
| 7 | 7 | 7 | 7 | 7 | 7 |
| 9 | 10 | 9 | 7 | 7 | 8 |
| 8 | 9 | 10 | 10 | 8 | 10 |
| | 10 | 9 | 9 | 10 | |
| | 9 | 11 | 10 | 8 | |
| | | 12 | 10 | | |
| | | 12 | 12 | | |
| | | 11 | 12 | | |

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J.; 19 yo F

No sig Hx of dev AE; stable family; Fam Hx bipolar

Hx depressive episodes

Eval s/p MVA; multiple evaluators assign Dx PTSD

Client (16 years, 0 months) Report Date: 11/26/2010

| | | | | | |
|----|----|----|----|----|----|
| 8 | 9 | 8 | 5 | 9 | 10 |
| 11 | 12 | 11 | 10 | 5 | 10 |
| 9 | 6 | 6 | 4 | 9 | 8 |
| | 10 | 8 | 8 | 6 | |
| | 11 | 9 | 11 | 10 | |
| | | 11 | 6 | | |
| | | 10 | 11 | | |
| | | 10 | 11 | | |

Age Typical - 14 to 16

| | | | | | |
|----|----|----|----|----|----|
| 10 | 10 | 10 | 10 | 10 | 10 |
| 12 | 12 | 12 | 10 | 10 | 11 |
| 11 | 11 | 12 | 11 | 10 | 12 |
| | 11 | 11 | 11 | 12 | |
| | 12 | 12 | 12 | 11 | |
| | | 12 | 12 | | |
| | | 12 | 12 | | |
| | | 12 | 12 | | |

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