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

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?

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.

NMT Core Principles
A. Brain Organization and Function

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**Introduction to the NMT**

**Neurodevelopment and Memory**

1. **Cortical Modulation**
   - **Mature**
   - **Developing/neglect**

2. **Afferent Components: Modulation of Primary Regulatory Networks**
   - **Top-down modulation**
   - **Bottom-up modulation**

3. **Multi-level Processing**

4. **The Neuron**

5. **NMT Core Principles**
   - B. Neurodevelopment and Memory
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.

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.

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

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.

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.
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.

Neuroarchaeology

- 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.

“Out” “In”

New experience is “filtered” through past experience

NMT Core Principles

C. Relational Neurobiology and Attachment

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.

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.
Introduction to the NMT

Intimacy Barrier

History of Relational Interactions

Casual - Routine - Personal - Intimate

Increase physiological distress

Decrease physiological distress

Relational interactions

Multi-sensory cues

LC NE

RA DA
Introduction to the NMT

Stimulation of “Reward” Neural Systems in the Human Brain: Multiple
- Music and rhythmic sensory input
- Drugs of Abuse (cocaine, opiates, stimulants)
- Sweet, salty, fatty foods
- Positive Human Interaction
- Sex

Behavior consistent with value or belief system
- Sensation of pleasure and safety
- Release of hormones and “calmer” regulation of stress response neural systems

Decrease physiological distress

Drugs of Abuse
- Cocaine, opiates, stimulants
- EtOH
- Sweet, salty, fatty foods

Behavior consistent with value or belief system
- Cut, pick, pull
- Sex
- Music and rhythmic sensory input

Stress Core Principles
D. Stress, Distress and Trauma

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

Responses to Stress, Distress, Trauma
- Unpredictable
  - Severe
  - Prolonged
- Predictable
  - Moderate
  - Controlled

Vulnerability
Resilience

Dissociation
- Terror
- Fear
- Alarm
- Alert
- Calm

DISSOCIATIVE/AROUSAL BALANCE
- Dissociation
- Arousal
- Females > Males
- Young Children > Older Children
- Torture/Pain > Observer
- Inescapable Helplessness > Action Active Role
A five year old girl who survived the ATF raid on Ranch Apocalypse asked to draw her home. The dots in the roof are from bullets.
To neglect a child is to murder them.

Daniel Dafoe

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.

Multiple Forms of Neglect

<table>
<thead>
<tr>
<th>DOMAINS</th>
<th>PATTERN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional</td>
<td>Episodic</td>
</tr>
<tr>
<td>Social</td>
<td>Chaotic</td>
</tr>
<tr>
<td>Cognitive</td>
<td>Total global</td>
</tr>
<tr>
<td>Motor</td>
<td></td>
</tr>
</tbody>
</table>

3 Year Old Children

Normal

Extreme Neglect

NMT Core Principles

F. Neurosequential Model of Therapeutics

Sequential Development

Sequential Vulnerability

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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

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

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

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
NMT Core Principles

G. NMT Application and Outcomes

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)

Primary Neural Impact of Various Therapeutic, Educational or Enrichment Activities

Christopher’s Case: 14 yo M, Youth Treatment Center

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NMT Core Principles

H. Current NMT Metric Reports

Drop in Restraints at AYN Residential and Day-hospital programs with NMT

Restraints/month

12 mos prior 1st 6 mos NMT 2nd 6 mos NMT 3rd 6 mos NMT

Client (15 yrs, 8 months)  Report Date: 7/24/2010

NMT Core Principles

M., 15 yo F
AYN
15 yo F, Hx of abuse, DV, neglect, removed at age 6, 20 + placements:
The ChildTrauma Academy

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Mx; 6 yo M
Hx intrauterine: SA/EEGH; severe neglect and abuse; removed at 12 mos; multiple placements; adopted at age 2
Dx at time of eval: ODD, ADHD

D. D.; 13 yo M
Hx early dev abuse/neg; adopted at 10 mos of age
At time of eval Dx: ADHD, Hx ODD, CD

Creating Policy and Practice that Capitalize on Biological Realities
Democracy, public education, suffrage, civil rights – and, ultimately, early childhood investment

The Mismatch Between Opportunity and Investment
Spending on Programs to "Change the Brain"

Brain's Capacity for Change

CTA Websites
www.ChildTrauma.org
www.ChildTraumaAcademy.com

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