I Fit, UFIT, We All Fit Together: Advances in Pediatric Neurorehabilitation

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Objectives

• **Learning Objective #1:** Integrate the knowledge of CP related classification tools and models of care. Learn who’s appropriate, how much therapy to provide and how to engage patients and families.

• **Learning Objective #2:** Explore motor learning approaches for children through the use of constraint induced movement therapy and intensive bimanual training.
Considerations and Types of Decisions Made by Therapists

• Who needs intervention and why?
• What are the expected outcomes of the intervention?
• How do we document the outcomes?
• How many visits will it take to achieve the outcomes?
• Evaluation of overall clinical program
MOTOR CONTROL THEORIES
Frameworks to Guide Practice

• Rehabilitation theories have evolved over time to match the understanding of motor recovery, executive functioning development, and interplay of the child in the context of family.

• Motor Developmental Theories
  – NDT
  – Dynamic System’s Theory
  – Neuronal Group Selection Theory
Promotion of function as a goal of therapy intervention

In the past, goals of therapy were to normalize movement patterns, reduce neurological signs, and minimize the development of secondary impairments.

“From a functional perspective, therapy for children with motor impairments should aim at enabling the children to master tasks and participate in activities that are important to the child and family” (Ostensjo et al, 2003)
Dynamic Systems Approach

• Adaptation of the environment and/or the task is considered acceptable as a solution to a motor problem rather than focusing on changing the abilities of the child
• In a task/context-focused approach, the child’s interest in motor-based tasks is identified as are the constraining factors, and treatment focuses on modifying the identified constraints
Theoretical Shift

• Philosophical and practical shift from previously held tenets is driven by factors including models of health status, family-centered principles, and improved theories of motor control and motor learning
FACTORS THAT IMPACT HAND SKILL DEVELOPMENT
CLASSIFICATION SYSTEMS IN CP
### GMFCS Level I
Children walk indoors and outdoors and climb stairs without limitation. Children perform gross motor skills including running and jumping, but speed, balance and co-ordination are impaired.

### GMFCS Level II
Children walk indoors and outdoors and climb stairs holding onto a railing but experience limitations walking on uneven surfaces and inclines and walking in crowds or confined spaces.

### GMFCS Level III
Children walk indoors or outdoors on a level surface with an assistive mobility device. Children may climb stairs holding onto a railing. Children may propel a wheelchair manually or are transported when traveling for long distances or outdoors on uneven terrain.

### GMFCS Level IV
Children may continue to walk for short distances on a walker or rely more on wheeled mobility at home and school and in the community.

### GMFCS Level V
Physical impairment restricts voluntary control of movement and the ability to maintain antigravity head and trunk postures. All areas of motor function are limited. Children have no means of independent mobility and are transported.

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Gross Motor Function Classification System (GMFCS)

Manual Abilities Classification System

I. Handles objects easily and successfully

II. Handles most objects with reduced quality and/or speed of achievement.

III. Handles objects with difficulty; needs help to prepare and/or modify activities.

IV. Handles a limited selection of easily managed objects in adapted situations.

V. Does not handle objects and has severely limited ability to perform even simple actions.
There are a multitude of factors to consider for successful hand use for daily activities.

- Neuroscience Factors focus on corticospinal tract integrity and excitability of the motor cortex.
- Disruption in any of these systems, greatly impacts the individual’s ability to succeed and can contribute to developmental disregard.
MOTOR LEARNING PRINCIPLES
Motor Learning Assumptions

• Motor learning assumes a degree of brain plasticity and expects reorganization or recovery potential.

• Retraining must be applied strategically and skillfully to maximize engagement, learning, and generalization to function (Dobkin & Dorsch, 2013).
The Challenges to Developmental and Motor Theories

Runaway Train of Development + Individual Differences = Variability Across All Children
Pediatric Challenges

• The influence of:
  – Maturation
  – Limited processing skills

• Balancing the core belief that play and exploration drive movement and skill acquisition.

• Harnessing development potential
Specific Motor Learning Techniques

• Session structure and context,
• Teaching techniques,
• Distribution and practice structure,
• Whole vs. part practice, and
• Task specificity and executive functioning
Approaches to Therapy

vs.


What is the evidence for our interventions?

A systematic review of interventions for children with cerebral palsy: state of the evidence

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This article is commented on by Msall on pages 877–878 of this issue.
Grades of Evidence—Traffic Alert Action

(Novak et al., 2013)
Note: SI was evaluated in the context of children with CP only. Refer to article for discussion on NDT.

(Novak et al., 2013)
UFIT—UPPER EXTREMITY INTENSIVE THERAPY FRAMING THERAPY CARE PLANS
Present Day Challenges to Intensives

• Competing therapy and educational needs
• Limited resources
• Chronic care needs
• Financial challenges for funding therapy and caregiver support
Framing Therapy Intensives

- Create intensity through caregiver engagement and empowerment
- Utilize episodes of care to meet chronic needs
- Equip families with knowledge. Dispel the “expert therapist” myth!
Successful Transitions to Episodic Care

• Parental confidence in:
  – Red flags of concern
  – Knowledge of the follow up plan
  – Comfort level with carrying over concepts to the home and community setting

• How do you get there?
• Treatment fidelity matters
• Sharing this knowledge with families (while monitoring for information overload) benefits all.
• Leverage families efforts and contributions to best benefit all during more intensive bursts of care
CONSTRAINT INDUCED MOVEMENT THERAPY
Gillette’s 3-Phase Approach to CIMT...

It’s a marathon, not a sprint.

• Preparation—4 weeks
• Casting—4 weeks
• Bimanual Practice—4 weeks+
Given it’s a marathon...how do we make it engaging, worthwhile, and more importantly...uber cool?
Functional, Individualized Therapy

- Shaping
- WB’ing
- ROM
- Strength
- High Reps
- Sensory Input

(T. Rich, 2013)
Creative Curriculums

• Differentiates this therapy from standard, developmental therapy
• Engages the child at a new level
• Positively impact self-esteem and a success-based intervention
But...Are two hands better than one?

- Bimanual Intensive Training - Gordon, 1997
- Benefits of each treatment modality
- Utilizing both approaches
BIMANUAL TRAINING
Hand-Arm Bimanual Intensive Training (HABIT)

- Developed out of Columbia University
- Focuses on delineating the roles of the hands with one as a stabilizer and one as active
- Developed with the same principles that have been associated with strong outcomes in CIMT
- Periods of intensive bimanual training often follow CIMT
WHAT NEXT?
What intervention do you choose?

• Is CIMT the best?
• Is HABIT more functional?
• Should traditional therapy morph to be more inclusive of intensive therapy techniques and approaches?
• What is the role of internal motivation in pediatrics?
Thoughts for Consideration

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<tr>
<th>Table II: Criteria for selection of constraint-induced movement therapy (CIMT) or bimanual training</th>
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<tr>
<td>Dexterity</td>
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<td>Bimanual assist quality</td>
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<td>Frequency of use</td>
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<tr>
<td>Function (goals)</td>
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<tr>
<td>Coordination of two hands</td>
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<tr>
<td>Mild hemiplegia</td>
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<td>Severe hemiplegia</td>
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<td>Reduce impairments</td>
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<td>Low IQ</td>
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<td>Behavioral problems</td>
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<td>Restraint tolerance problems</td>
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<td>Short duration available</td>
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<td>Diversity of activities</td>
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<td>Ease of administering</td>
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✔️, preferred training protocol; ?, hypothesized.
Treatment Components of CIMT and HABIT

- Active Problem Solving
- Graded Constraints (Shaping)
- Motivation
- Mass Practice
- High Intensity

(T. Rich, 2013)
There are a variety of options. What is your goal?

Individualized therapy based on client based goals takes advantage of all systems—motivation, functional activities, and arm use.

Instill a sense of accomplishment and success which contributes to overall resiliency.

Creativity is key!
Concluding Thoughts

• Pediatric neurorehabilitation is ever evolving and EXCITING!

• Collaborative interventions provide holistic views of the child and meet complex therapy needs.

• Creativity wins you engagement and sustained results.
Any Questions?

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• The Episodic Care original presentation was developed with Robin McDonald, PT and Heather Bracken, MA, CCC-SLP (2010).
References

• Classification Tools:
  – Manual Abilities Classification System: http://www.macs.nu

• Texts:
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