

# *Helping Kids with Hemiplegia* Summer Camp:

Background Information, Handling Techniques, and a Comparison of Intervention Strategies

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# Learning Objectives

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*Upon completion of this presentation, the learner will be able to:*

- ❖ Compare and contrast constraint-induced movement therapy intervention methods to bimanual intensive training among children diagnosed with hemiplegic cerebral palsy
- ❖ Acquire knowledge related to cerebral palsy, including background information, signs and symptoms, epidemiology, classifications, and clinical presentation
- ❖ Discuss basic information pertaining to camp, including time and location, camper description, and involved games and activities
- ❖ Attain the ability to devise an appropriate home exercise program for camp participants
- ❖ Understand skills taught and implemented in the *Helping Kids with Hemiplegia* summer camp, including handing techniques, proper facilitation, grading of tasks, and sequencing patterns for activities of daily living
- ❖ Familiarize himself/herself with the current available evidence on constraint-induced movement therapy, bimanual intensive therapy, and more novel approaches

# What is Constraint-Induced Movement Therapy (CIMT)?



# CIMT Overview<sup>1,2</sup>

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- ❖ Constraint applied to less involved upper extremity (UE)
- ❖ Intensive unimanual training in more involved UE
- ❖ Forced-use



# What is Bimanual Intensive Training (BIT)?



# BIT Overview<sup>1,2</sup>

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- ❖ Intensive bimanual training in both UEs
- ❖ Developed in response to CIMT limitations



# Introduction to Cerebral Palsy and Hemiplegia



# What is Cerebral Palsy (CP)?

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- ❖ *“A group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain”<sup>3</sup>*
- ❖ Most common childhood motor disability<sup>4</sup>
- ❖ Prevalence: 2.5 per 1000 persons<sup>4</sup>
- ❖ 60-100% infants with periventricular leukomalacia (PVL) are diagnosed with CP<sup>5,6</sup>



# Signs and Symptoms<sup>7</sup>

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- ❖ Developmental delay
- ❖ Lack of coordination
- ❖ Stiff or tight muscles
- ❖ Abnormal reflexes
- ❖ Weakness
- ❖ Gait impairments
- ❖ Abnormal muscle tone
- ❖ Involuntary movement
- ❖ Difficulties with swallowing or speech
- ❖ Fine and gross motor impairments
- ❖ Cognitive impairments
- ❖ Visual impairments



# GMFCS<sup>8</sup>

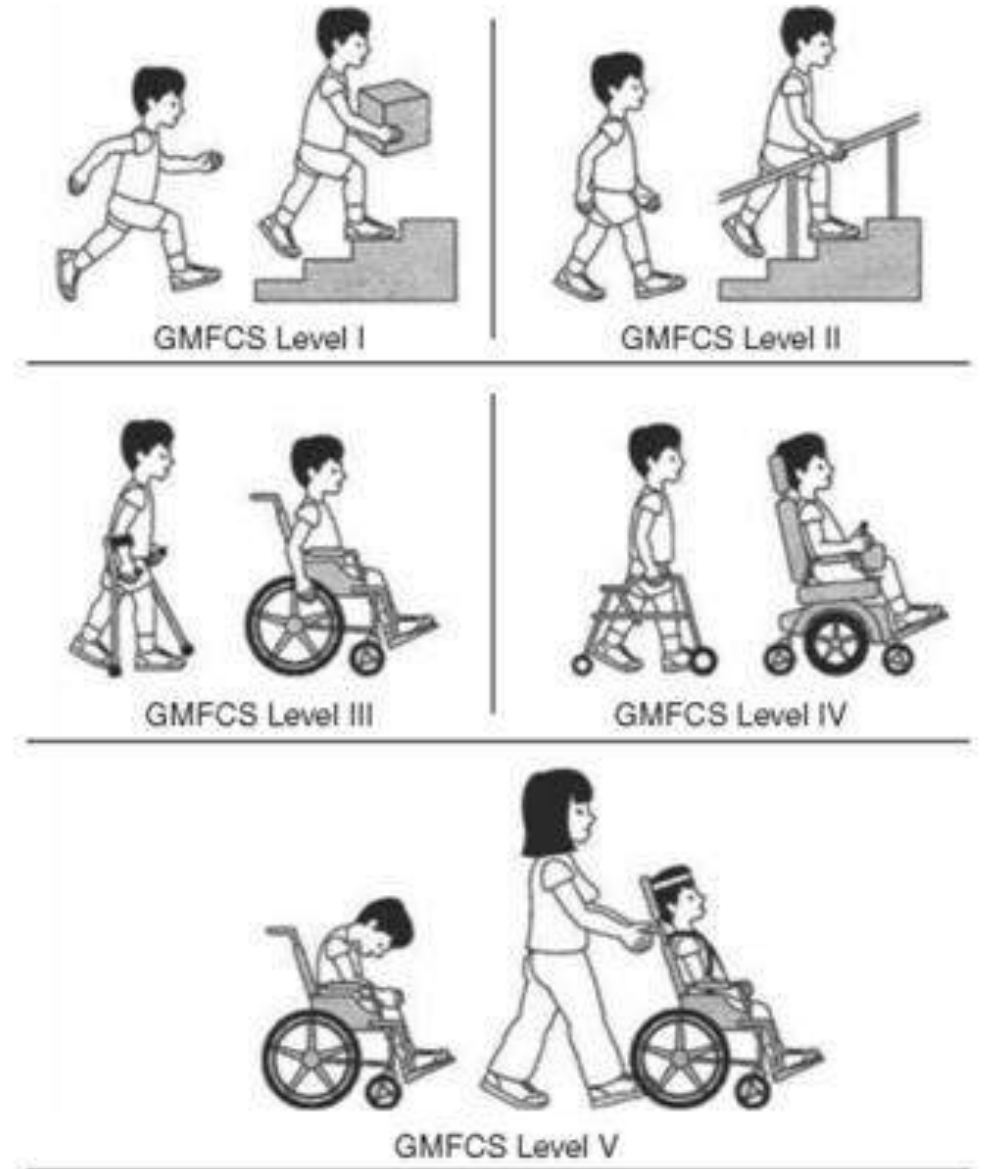
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## ❖ Gross Motor Function Classification System

- 5 level system
- Severity of motor impairment
- Reliable and valid

## ❖ Campers

- GMFCS Levels I and II



# MACS Scale<sup>37</sup>

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## ❖ Manual Ability Classification System (MACS)

- 5 level system
- Children with CP ages 4-18 years
- Ability to handle objects during daily activity

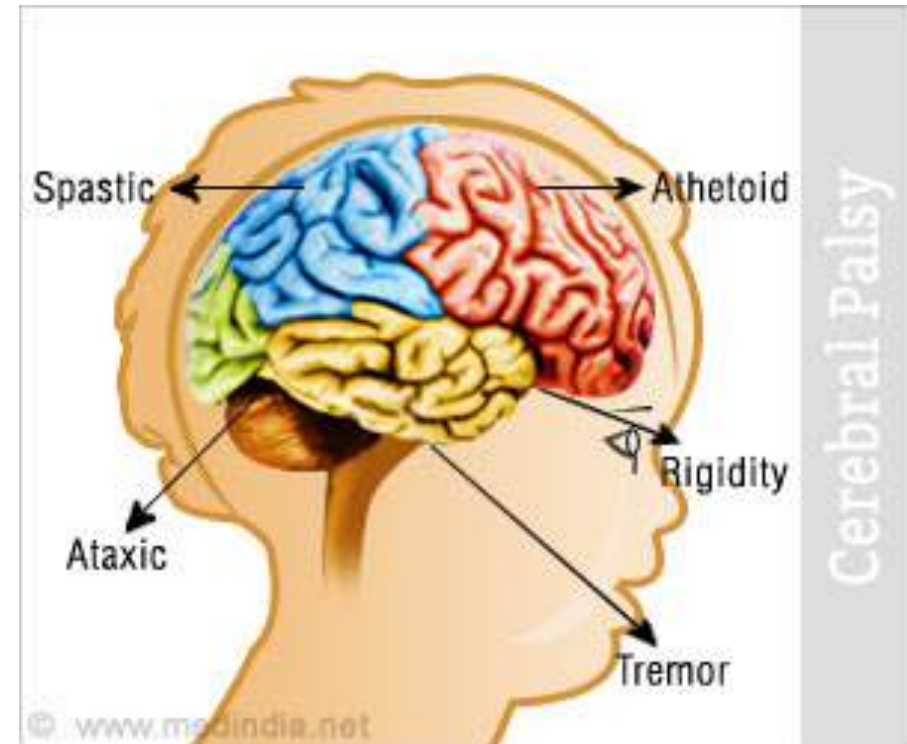
**Figure 1: Manual Ability Classification System<sup>2</sup>**

Level 1	Handles objects easily and successfully.
Level 2	Handles objects, but with somewhat reduced quality and/or speed of achievement.
Level 3	Handles objects with difficulty; needs help to prepare and/or modify activities.
Level 4	Handles a limited selection of easily managed objects in adapted situations.
Level 5	Does not handle objects and has severely limited ability to perform even simple actions.

# Other Classifications<sup>9</sup>

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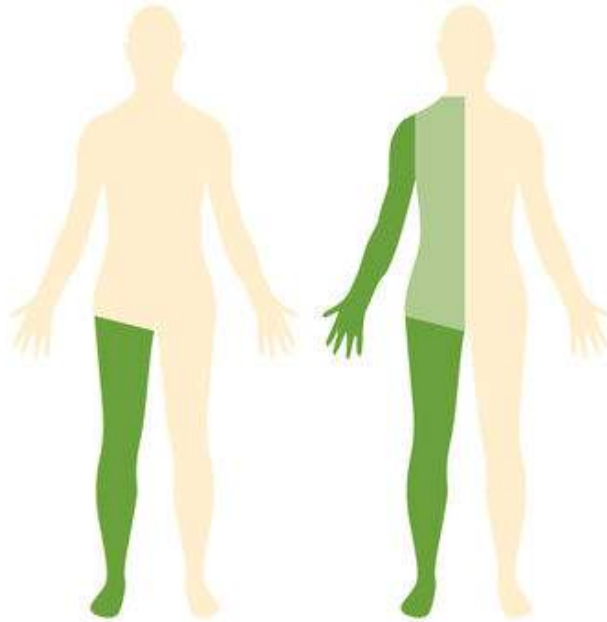
- ❖ Site of brain lesion
- ❖ Signs and symptoms
- ❖ Topographical involvement of extremities
- ❖ Timing of insult
- ❖ Degree of muscle tone



# Topographical Classification<sup>10</sup>

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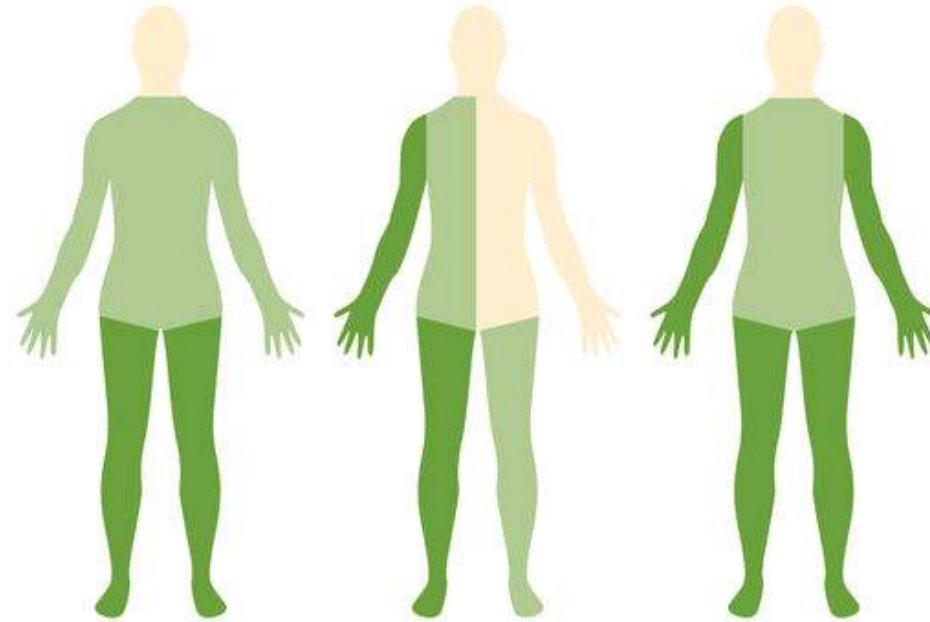
Unilateral cerebral palsy



Monoplegia

Hemiplegia

Bilateral cerebral palsy



Diplegia

Triplegia

Quadriplegia

Nature Reviews | Disease Primers

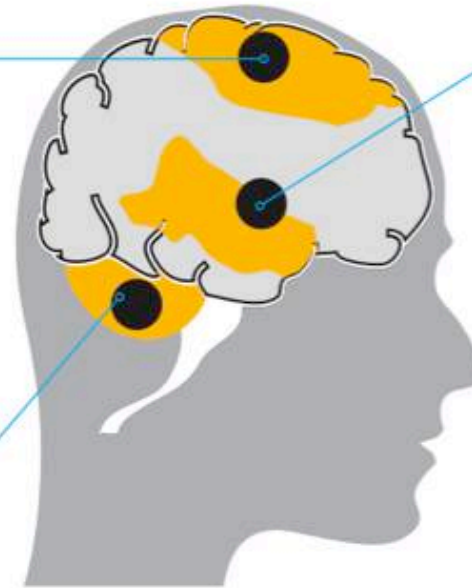
# Movement Classification<sup>7</sup>

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- ❖ Spastic
- ❖ Dyskinetic
  - Athetoid
  - Dystonic
- ❖ Ataxic
- ❖ Mixed

## MOTOR TYPES

**SPASTIC:** 70-80%.  
Most common form.  
Muscles appear stiff and tight. Arises from Motor Cortex damage.



**DYSKINETIC:** 6%.  
Characterised by involuntary movements. Arises from Basal Ganglia damage.

**MIXED TYPES:**  
Combination damage.

**ATAXIC:** 6%  
Characterised by shaky movements. Affects balance and sense of positioning in space. Arises from Cerebellum damage.

# Children with Hemiplegia<sup>1,2,11,12</sup>

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- ❖ Prevalence of congenital hemiplegia: 1 in 1300 live births
- ❖ Approximately 33% of children with CP have hemiplegia
- ❖ One-sided involvement
- ❖ Arm and hand involvement > leg involvement
  - Early hand preference

# Clinical Presentation<sup>13,14,38</sup>

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- ❖ More involved side:
  - Decreased range of motion
  - Increased stiffness and/or weakness
  - Fisting of the hand
  - Equinus deformity
- ❖ Gait abnormalities
- ❖ Balance deficits
- ❖ Poor executive function
- ❖ Fine and gross motor difficulties
- ❖ Developmental disregard
- ❖ Visual deficits
- ❖ Sensory deficits





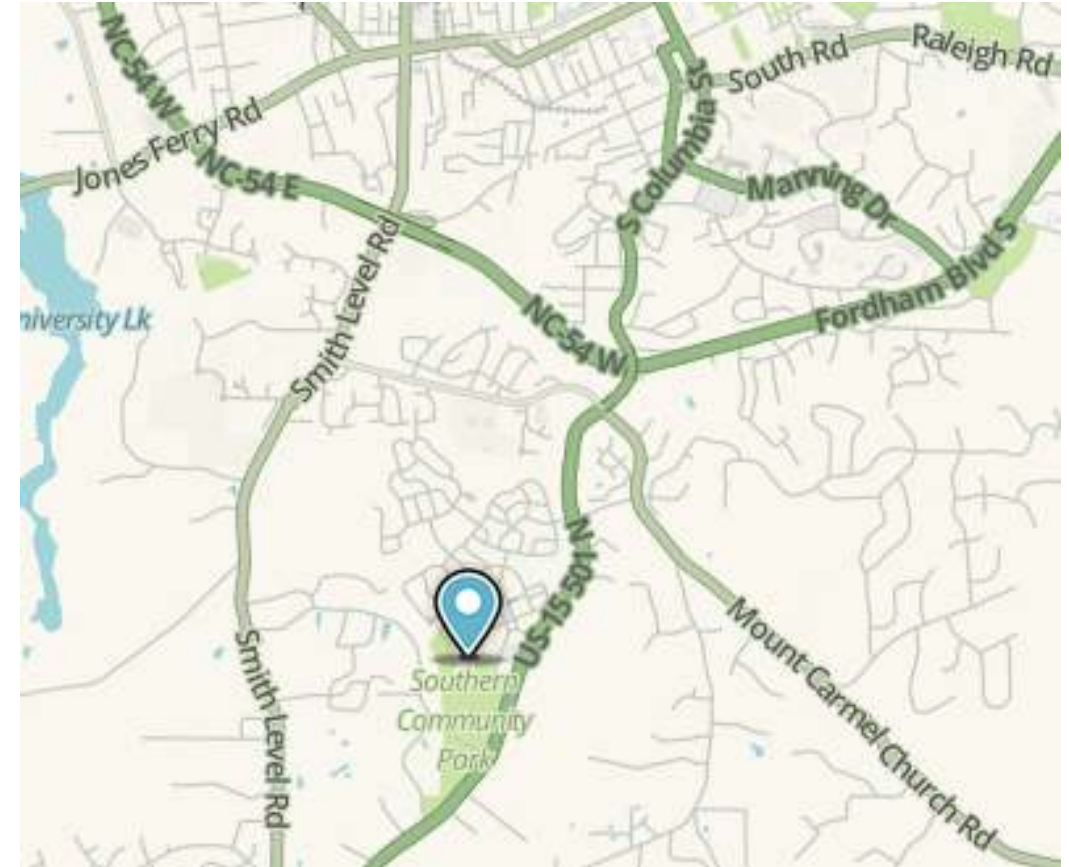
# Camp Day Logistics



# Camp Day Overview

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- ❖ Camp Hours: 9:00 a.m. – 3:00 p.m.
- ❖ Volunteer Hours: 7:45 a.m. – 3:30 p.m.
- ❖ Location: Mary Scroggs Elementary School
- ❖ Camp Duration: 8 consecutive days



# Camp Day Overview (Cont.)

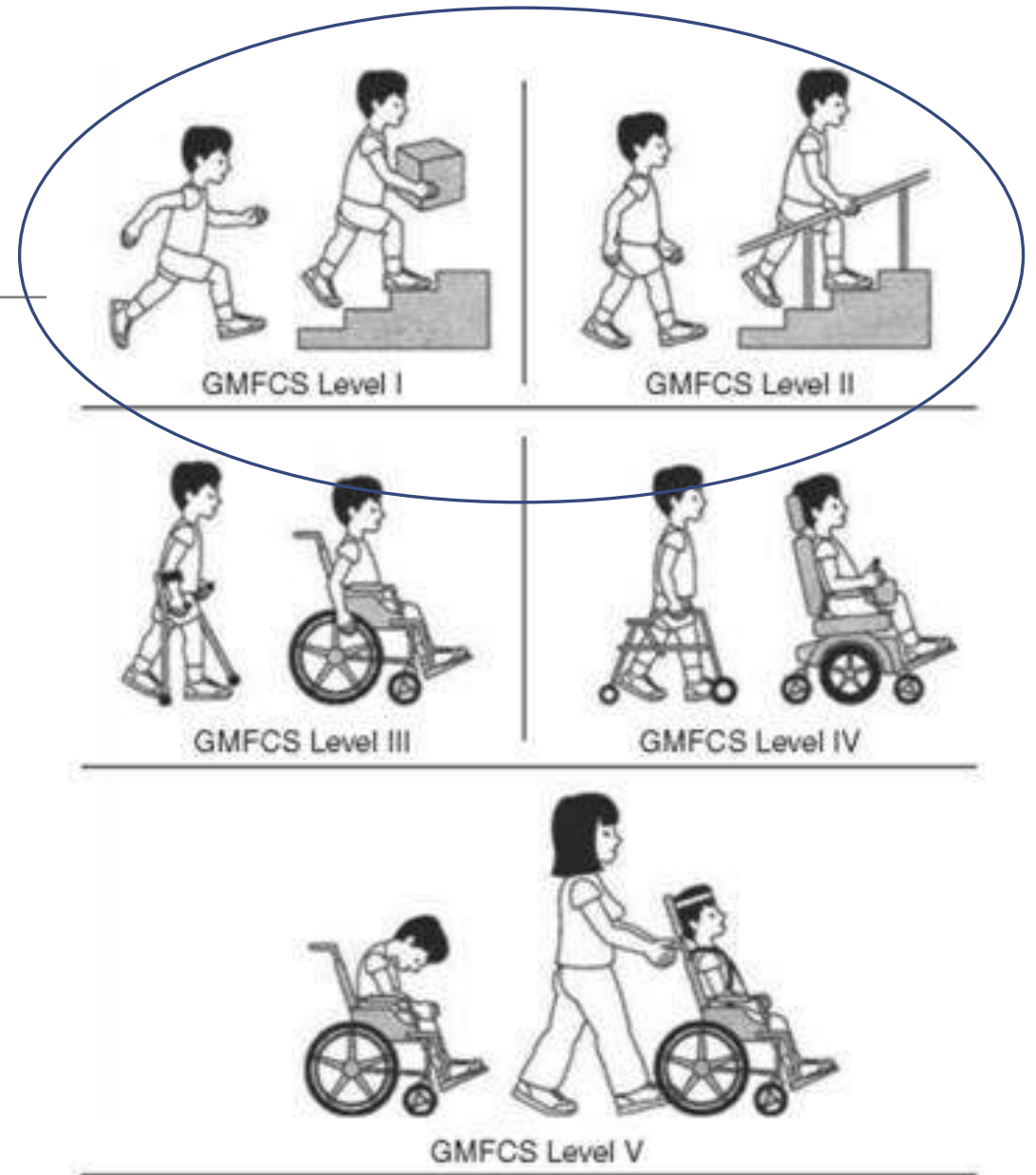
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- ❖ Cast fitting prior to camp
- ❖ Cast Wear:
  - Days 1-4 → 5 hours
  - Days 4-8 → 3-5 hours
- ❖ 45-minute morning session for ADLs
- ❖ 1-hour meal time



# Campers

- ❖ 35-40 campers
- ❖ 4-10 years old
- ❖ Volunteer to camper ratio → 2 to 1
- ❖ Inclusion Criteria:
  - Ambulatory
  - Can follow directions
  - Some hand use



# Typical Day at Camp

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- ❖ Meet in homeroom and practice ADLs for 45 minutes every morning
- ❖ Daily Schedule (45 minute blocks)
  - Fine Motor Room
  - Game Room
  - Sensory Room
  - Computer Room
  - Arts and Crafts
  - Gross Motor Play
- ❖ Snack time and meal time



# Things to Know

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## ❖ Cast Removal

- Bathroom breaks
- Washing hands

## ❖ Behavioral Challenges

## ❖ Hydration



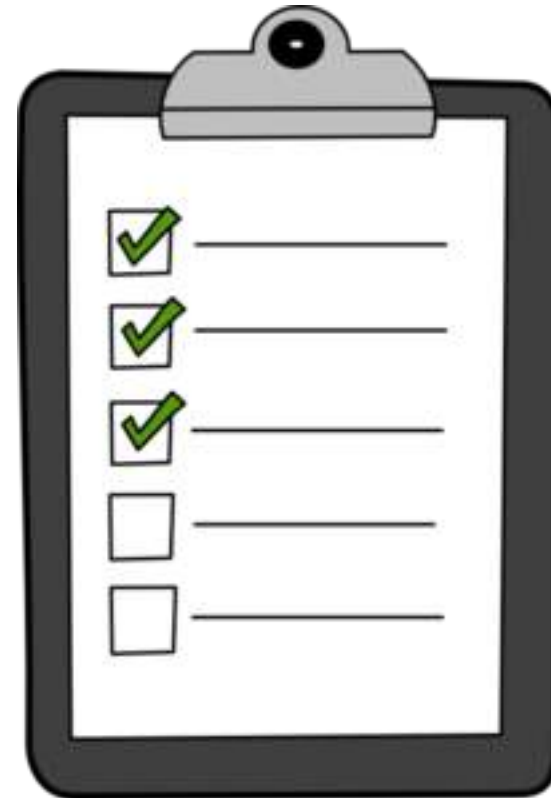
# Home Exercise Program (HEP)



# HEP Overview

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- ❖ Short, sweet, and easy to understand
- ❖ Focus on function
- ❖ What does the child enjoy?
- ❖ <http://chasa.org/treatment/hand-play/><sup>15</sup>





# HEP Example

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- ❖ Encourage participation in unimanual and bimanual tasks
  
- ❖ Example activities:
  - Dressing
  - Meal time
  - Cleaning
  - Playing outside
    - Kicking, throwing, catching a ball
    - Swinging
    - Riding a bicycle



# Handling/Facilitation Techniques and Grading of Activities



# Neuro-Developmental Treatment (NDT)<sup>16-18</sup>

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- ❖ *“Holistic and interdisciplinary clinical practice model informed by current and evolving research that emphasizes individualized therapeutic handling based on movement analysis for habilitation and rehabilitation of individuals with neurological pathophysiology”*
- ❖ *“Dynamic reciprocal interaction between the client and therapist for activating optimal sensorimotor processing, task performance, and skill acquisition to enable participation in meaningful activities”*
- ❖ Goal: Optimize function in everyday activities

# NDT Rationale and Basis<sup>19-22</sup>

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## ❖ Effective in improving...

- Sensorimotor consequences in posture and balance in children with CP
- Functional motor level and independence in children with CP
- Patient quality of life

## ❖ Creation of new neural pathways

## ❖ Uses problem solving and clinical reasoning

# NDT Principles<sup>19-22</sup>

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- ❖ Therapeutic handling
- ❖ Repetition and practice
- ❖ Grading of activities
- ❖ Proximal to distal approach
- ❖ Increased weight bearing in more involved limbs



# Grading of Movements<sup>24</sup>

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## ❖ M.A.T.C.H. Acronym

- **M**odify the task
- **A**lter expectations
- **T**each strategies
- **C**hange the environment
- **H**elp by understanding



# NDT Components<sup>19-22</sup>

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## ❖ Preparation

- Analyze the situation and environmental set-up

## ❖ Movement

- Active participation

## ❖ Function

- Utilization of more involved arm to assist the other in bimanual tasks

# Preparation in Sitting

- ❖ Image to the left
  - Poor posture and alignment
- ❖ Image to the right
  - Good posture and alignment
    - ✓ Hips, knees, and ankles at 90°
    - ✓ Shoulders relaxed
    - ✓ Good spinal alignment

## Sit right then write





# Sequencing of Tasks



# Dressing: Donning/Doffing Shirt<sup>25</sup>

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## ❖ Left-Sided Involvement

- Donning: Left arm goes in first
- Doffing: Left arm comes out last

## ❖ Right-Sided Involvement

- Donning: Right arm goes in first
- Doffing: Right arm comes out last

### Option 1:



Use stronger arm to help weak arm slide inside sleeve.



Pull t-shirt over head with stronger arm.  
If possible, use weak arm to help.



Put stronger arm in sleeve. Pull down shirt.

## Option 2:



Use strong arm to help weak arm slide inside sleeve.



Put stronger arm into other sleeve.



Flip shirt over and through the head opening using the stronger arm. If possible, use weak arm to help.

# Donning/Doffing Pants<sup>25</sup>

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## ❖ Left-Sided Involvement

- Donning: Left leg goes in first
- Doffing: Left leg comes out last

## ❖ Right-Sided Involvement

- Donning: Right leg goes in first
- Doffing: Right leg comes out last

## ❖ Right- and Left-Sided Involvement

- Non-involved arm used primarily for both donning/doffing
- Involved arm used for guidance

## ❖ Tip: When donning pants, instruct to use non-involved arm to pull pants up from the back and involved arm in the front



With your child sitting, use stronger arm to put opposite foot into pant leg. Use weak arm to help guide the pants.



Use stronger arm to pull foot into pant leg. Use weak arm to guide the pants.



With the child standing, use stronger arm to pull the pants from the back. Use weak arm to pull pants up from the front.

# Donning/Doffing Socks and Shoes

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- ❖ Cross legs
- ❖ Use non-involved hand when putting on socks and shoes
- ❖ Involved hand is used for guidance



# CIMT and BIT Research





# CIMT vs. BIT<sup>1-2,26-31</sup>

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- ❖ Equally effective
- ❖ CIMT → Improvements in unimanual tasks
- ❖ BIT → Improvements in bimanual tasks
- ❖ ~60 hours of intervention
- ❖ ↑ dosage (mod to high) ≠ ↑ improvements
- ❖ Trained volunteers
- ❖ Individual or group sessions

*Please see Critically Appraised Topic and Evidence Table for more information on the comparison of CIMT and BIT*

# Combination of CIMT and BIT<sup>32,33</sup>

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## ❖ Aarts et al, 2010

- 6 weeks mCIMT followed by 2 weeks BIT
- 3 hours/day, 3 days/week
- ↑ spontaneous use in involved UE

## ❖ Brandao et al, 2010

- 2 weeks CIMT followed by 1 week BIT
- 3-4 hours/day, 5 days/week
- ↑ self-care skills, but not movement efficiency in the involved UE

# Hybrid Models<sup>34,35</sup>

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## ❖ Cohen-Holzer et al, 2017

- Hybrid (BIT + 1 hour of CIMT per day) versus BIT
- 6 hours/day, 5 days/week for 2 weeks
- Equally effective in bimanual task improvements
- Hybrid → involved UE manual skills
- BIT → non-involved UE manual skills

## ❖ Pascual et al, 2015

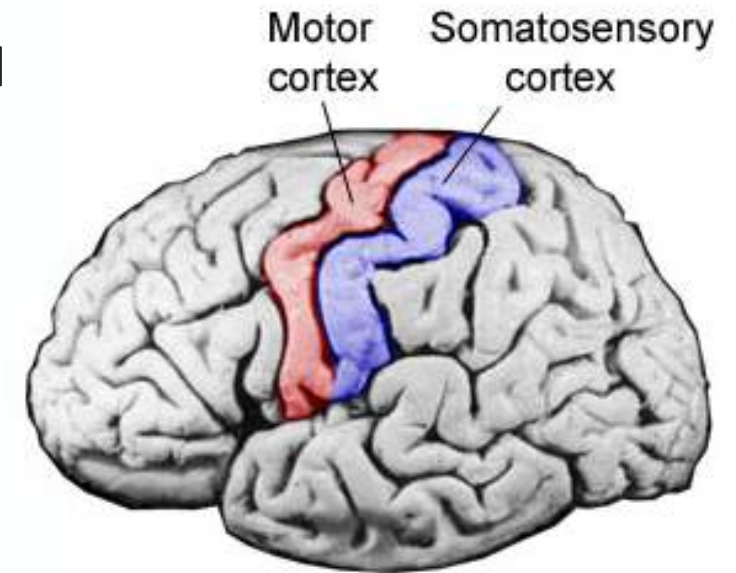
- Hybrid model – 2 hours CIMT + 4 hours BIT per day
- 6 hours/day for 10 consecutive days
- Effective in bimanual task performance

# Neuroplastic Changes<sup>36</sup>

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## ❖ Sterling et al, 2013

- Examined gray matter changes via MRI
- CIMT program
  - 3 hours/day for 15 consecutive days
- Improvements in gray matter in contra- and ipsilateral sensorimotor cortex regions
  - *Reorganization*
- Improvements in contralateral hippocampus
  - Motor learning and memory



# *Feedback!*

Please take the time to provide feedback using the following link:

<https://www.surveymonkey.com/r/SC73F6B>



*Thank you for your attention!*

**Contact Information:**

Courtney Bowers

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# Resources

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