

OHSU

## Pediatric Constraint-Induced Movement Therapy (pCIMT) and Bimanual Training (BIT)

Margaret Wolf, MS, OTR/L  
Institute on Development and Disability  
October 30<sup>th</sup>, 2019

1

---

---

---

---

---

---

---

---

## Objectives

- Define pCIMT and BIT and relationship to cerebral palsy (CP)
- Understand underlying theory behind pCIMT/BIT
- Increase familiarity of pCIMT/BIT protocols and what treatment sessions look like

2

---

---

---

---

---

---

---

---

## Cerebral palsy (CP)

- Disorder of the development of movement and postures
- Disturbances of the developing fetal or infant brain
- Non-progressive
- Prevalence: 3.6 per 1000 children ages 8 years

3

---

---

---

---

---

---

---

---

## Difficulties associated with CP

- Cognitive: memory, executive function, attention and concentration
- Speech and language: expressive language, social communication
- Sensory: vision, sensory awareness
- Behavior: agitation, hyperactivity, moodiness

4

---

---

---

---

---

---

---

---

## Hemiplegic CP

- Stiffness/weakness on one side of the body
- Only using one hand during play before 3 years old
- Keeping one hand fisted
- Difficulty with walking and balance
- Difficulty with fine motor tasks

5

---

---

---

---

---

---

---

---

**MACS**

**What do you need to know to use MACS?**  
The child's ability to handle objects in important daily activities, for example during play and leisure, eating and dressing.  
In which situation is the child independent and to what extent do they need support and adaptation?

- I. Handles objects easily and successfully.** At most, limitations in the ease of performing manual tasks requiring speed and accuracy. However, any limitations in manual abilities do not restrict independence in daily activities.
- II. Handles most objects but with somewhat reduced quality and/or speed of achievement.** Certain activities may be avoided or be achieved with some difficulty, alternative ways of performance might be used but manual abilities do not usually restrict independence in daily activities.
- III. Handles objects with difficulty; needs help to prepare and/or modify activities.** The performance is slow and achieved with limited success regarding quality and quantity. Activities are performed independently if they have been set up or adapted.
- IV. Handles a limited selection of easily managed objects in adapted situations.** Performs parts of activities with effort and with limited success. Requires continuous support and assistance and/or adapted equipment, for even partial achievement of the activity.
- V. Does not handle objects and has severely limited ability to perform even simple actions.** Requires total assistance.

**Distinctions between Levels I and II**  
Children in Level I may have limitations in handling very small, heavy or fragile objects which demand detailed fine motor control, or efficient coordination between hands. Limitations may also involve performance in new and unfamiliar situations. Children in Level II perform almost the same activities as children in Level I but the quality of performance is decreased, or the performance is slower. Functional differences between hands can limit effectiveness of performance. Children in Level II commonly try to simplify handling of objects, for example by using a surface for support instead of handling objects with both hands.

**Distinctions between Levels II and III**  
Children in Level II handle most objects, although slowly or with reduced quality of performance. Children in Level III commonly need help to prepare the activity and/or require adjustments to be made to the environment since their ability to reach or handle objects is limited. They cannot perform certain activities and their degree of independence is related to the supportiveness of the environmental context.

**Distinctions between Levels III and IV**  
Children in Level III can perform selected activities if the situation is prearranged and if they get supervision and plenty of time. Children in Level IV need continuous help during the activity and can at best participate meaningfully in only parts of an activity.

**Distinctions between Levels IV and V**  
Children in Level IV perform part of an activity, however, they need help continuously. Children in Level V might at best participate with a simple movement in special situations, e.g. by pushing a button or occasionally hold underlining objects.

6

---

---

---

---

---

---

---

---

### Other pediatric conditions related to pCIMT

- Traumatic brain injury
- Brain tumor
- Brachial plexus

---

---

---

---

---

---

---

7

### What is CIMT?

- Definition: Rehabilitation strategy to increase functional use of the paretic upper extremity (UE) through repetitive and adaptive tasks while non-paretic UE is restrained
- Hypothesis: forced use with repetitive practice
- Theoretical foundation: learned non-use and neuroplasticity



---

---

---

---

---

---

---

8

### Pediatric CIMT (pCIMT)

- Constraint of the less-impaired or unimpaired UE
- High dosage of training
- Use of shaping techniques and repetitive practice with task variation
- Learning functional skills in natural and diverse settings
- Transition (post-therapy) planning for maintenance of gains

---

---

---

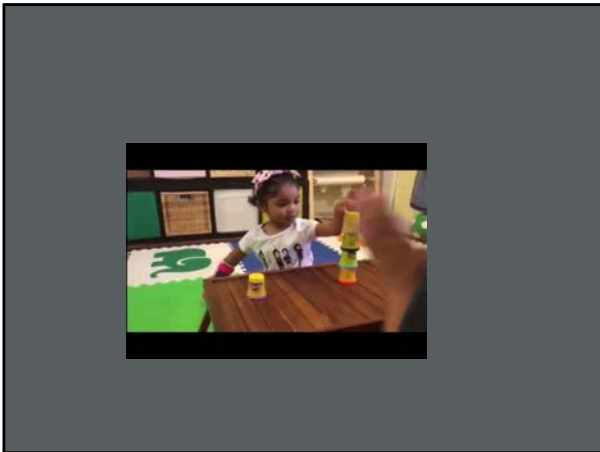
---

---

---

---

9



10

---

---

---

---

---

---

---

---

Bimanual Training (BIT)

- Structured, intensive practice
- Activities that require coordination of both UE together
- Whole-task practice and part-task practice
- Decrease verbal prompting

11

---

---

---

---

---

---

---

---

Example

- Video clip: child with hemiplegic CP during BIT week participating in dressing activity

[https://youtu.be/-oBp\\_-ezAzI](https://youtu.be/-oBp_-ezAzI)

12

---

---

---

---

---


---

---

---

### p-CIMT/BIT program at CDRC

- Based off programs from Cincinnati Children's and Nationwide Children's
- CDRC Stroke clinic
- Data repository
- Community collaboration




---

---

---

---

---

---

---

---

13

### Inclusion and Exclusion Criteria

<p><b>Inclusion</b></p> <ul style="list-style-type: none"> <li>• Client is 6 months of age or older</li> <li>• Unilateral upper extremity impairment associated with a neurological condition (CP, TBI, brachial plexus injury)</li> <li>• Caregiver available to implement home program and participate in intensive therapy session</li> </ul>	<p><b>Exclusion</b></p> <ul style="list-style-type: none"> <li>• Noted contractures limiting upper extremity function</li> <li>• Dystonia that prevents controlled movement with the involved upper extremity</li> <li>• Difficulty participating in play or functional activities (due to behavioral or other concern)</li> </ul>
--	--

---

---

---

---

---

---

---

---

14

### Protocols

	Protocol 1	Protocol 2
Duration of intervention	4-5 weeks	8 weeks
Evaluation, casting, and re-evaluation	1-3 additional sessions	1-3 additional sessions
pCIMT/BIT	2 weeks pCIMT 1 week BIT	4 weeks pCIMT 2 weeks BIT
Treatment with therapist	1 hour/day; 3x/week with OT and PT	1 hour/day; 1x/week with PT or OT
Home program	3 hours per day with trained caregiver (not including therapy time)	4-6 hours/week
Constraint	Constraint worn for all waking hours during 1 <sup>st</sup> 2 weeks, off for 3 <sup>rd</sup> week	Constraint worn during therapy sessions and home program practice

---

---

---

---

---

---

---

---

15

## Assessments

- Assisting Hand Assessment (AHA) and mini-AHA
- Canadian Occupational Performance Measure (COPM)
- MACS, mini-MACS

---

---

---

---

---

---

---

---

16

## AHA and mini-AHA

- Measures how effectively the affected hand and arm is used in bimanual performance
- Videotaped observation of child's spontaneous play with select toys
- AHA: ages 18 months-12 years
- Mini-AHA: ages 8 months-18 months




---

---

---

---

---

---

---

---

17

## Canadian Occupational Performance Measure (COPM)

- Focus on occupational performance in all areas of life
- Issues of personal importance
- Detect changes in self-perception of performance
- For pCIMT – parent perspective

CANADIAN OCCUPATIONAL PERFORMANCE MEASURE		
<small>           Subject: _____            Age in Months: _____ Years: _____            The Canadian Occupational Performance Measure (COPM) is a self-rated measure of occupational performance. It is used to assess the perceived importance of occupational performance and the level of performance in relation to self-perception of performance in relation to self-perception of performance.         </small>		
Client Name	Occupation	Date
Age	Gender	Site
Responsible Occupational Therapist		
Date of Assessment	Person Doing the Assessment	Date of Reassessment
Therapist		
Client/Significant Other		
Parent		
Version 2.0 (2008)		

---

---

---

---

---

---

---

---

18

### Constraint types:

- Wrist and hand
- Above elbow/full arm
- Wrap or sling
- Splint
- Cast



---

---

---

---

---

---

---

---

19

### Choosing the constraint

- Safety Considerations
- Developmental levels and goals of treatment
- Behavior
- Cognitive level

---

---

---

---

---

---

---

---

20

### Case Studies: Luisa

- Medical history
- Diagnoses
- Level of service
- Family supports
- Educational supports
- pCIMI/BIT Protocol



---

---

---

---

---

---

---

---

21

## Video

- AHA video of Luisa at 18 months old

<https://youtu.be/eCQz0LJN86o>

---

---

---

---

---

---

---

---

22

## Pre-test AHA: Luisa

### Video observations:

- reaches across to obtain an item
- grasping from dominant hand or therapist
- release to dominant hand
- AROM differences

**AHA unit score = 45**

**MACS: Level I**

---

---

---

---

---

---

---

---

23

## Pre-test COPM: Luisa

Occupational Performance Issue	P1	S1	P2	S2
1. Pulling pants down to use potty	3	2		
2. Put on and pull off sock	2	2		
3. Pulling off t-shirt	2	2		
4. Getting coat on	3	3		
5. Stabilizing bowl when eating	3	3		
6. Getting whole hand around toy	4	4		

---

---

---

---

---

---

---

---

24

### Treatment goal examples for Luisa

- Use LUE to pull on sock
- Use LUE to pull off pants
- Stabilizes object with L hand
- Grasp/release of small items
- Supination of LUE

---

---

---

---

---

---

---

---

25

### Video

- Luisa completing AHA after pCIMT trial

<https://youtu.be/rmmf2r7Wqc0>

---

---

---

---

---

---

---

---

26

### Post-test AHA: Luisa

**Video observations:**

- increased reach with AH
- better readjustment
- increased release from AH to table

**AHA unit score = 62 (+7 raw score)**

**Parent report:** "pleased with progress" "better opening of hand in play"

---

---

---

---

---

---

---

---

27

Post-test COPM: Luisa

Occupational Performance Issue	P1	S1	P2	S2
1. pulling pants down for potty	3	2	3	3
2. Put on and pull off sock	2	2	3	3
3. Pulling of t-shirt	2	2	3	3
4. Getting coat on	3	3	3	3
5. Stabilizing bowl when eating	3	3	4	4
6. Whole hand around toy	4	4	7*	7*

Performance score 1 = 2.8  
 Satisfaction score 1 = 2.2  
 Performance score 2 = 3.8  
 Satisfaction score 2 = 3.8

---

---

---

---

---

---

---

---

28

### pCIMT/BIT Repository

- Purpose: create a de-identified repository of pediatric patients enrolled in our pCIMT/BIT program at the CDRC.
- Initial data and outcome measures have been captured in our electronic medical record.
- Creation of repository will allow us to identify trends in therapy, analyze outcomes, and better match children with hemiplegia to appropriate protocols.

---

---

---

---

---

---

---

---

29

### Information collected

- Gender
- Affected side
- Age at Dx
- Current age
- Etiology
- Seizures
- Cognitive deficits
- Dx
- Secondary dx
- Botox
- Vision
- Protocol
- Trial #/Time between trials
- Test scores (AHA, COPM)
- MACS scores
- GMFCS scores
- Location of services
- Additional therapy
- Home program minutes

---

---

---

---

---

---

---

---

30

### Trends so far...

- 18 clients, 3 repeated
- Clients with higher initial AHA scores made more gains
- No significant gains on AHA for those with lower AHA scores (<25)
- Significant changes in performance and satisfaction scores on COPM

---

---

---

---

---

---

---

---

31

### Alternative models of pCIMT

- Camps
- Home-based
- Community-based
- Tele-health

---

---

---

---

---

---

---

---

32

### Intervention activities

<https://www.youtube.com/watch?v=IG3VClSAXPI&feature=youtu.be>

---

---

---

---

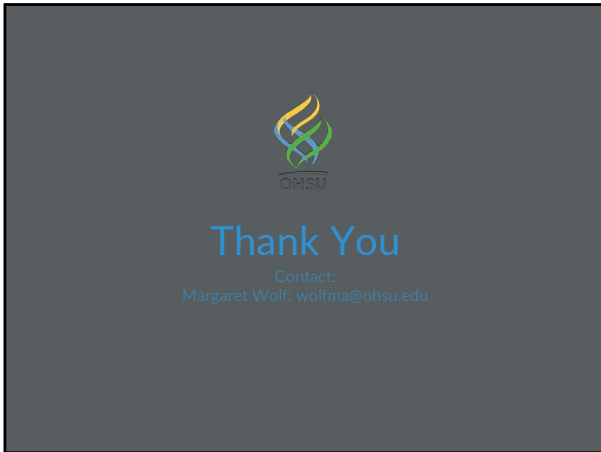
---

---

---

---

33



---

---

---

---

---

---

---

34