CASE STUDIES DEPICTING THE LIMITLESS CAPACITY FOR FUNCTIONAL GAIN USING MCIMT IN CHRONIC STROKE

HOLLY GRIEVES MS OTRL
SARA GARIEPY MS OTRL
COURSE OBJECTIVES

1.) Review literature in support of using mCIMT with chronic stroke.

2.) Define approach to Modified Constraint Induced Movement Therapy (mCIMT) utilized at Calvin College Rehabilitation Services.

2.) Explore case studies depicting the success of mCIMT with individuals recovering from chronic stroke.
POST-STROKE LEARNED NON-USE CYCLE
TRADITIONAL CIMT INCLUSION CRITERIA

✓ High motivation!
✓ Minimal cognitive dysfunction (<24 on MMSE)
✓ No significant spasticity of UE joints (Modified Ashworth ≥ 2)
✓ Adequate balance & walking ability while wearing the restraint
✓ Brunnstrom Stage ≥ 3
✓ Some hand function:
  ‣ 10 degrees of wrist extension
  ‣ 10 degrees of thumb abduction
  ‣ 10 degrees of finger extension (any 2 other digits)
TYPES OF RESTRAINT
### TRADITIONAL CIMT COMPONENTS

<table>
<thead>
<tr>
<th>Shaping</th>
<th>Task Practice</th>
<th>Behavioral Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training on motor tasks with gradual difficulty increase</td>
<td>Individual functional tasks completed repetitively</td>
<td>To transfer gains from clinic to daily life</td>
</tr>
<tr>
<td>10-15 tasks individualized to client- 10x lasting 10-30 seconds each</td>
<td>10-20 minute durations – rest as necessary</td>
<td>Behavioral contract- identifying tasks to be performed</td>
</tr>
<tr>
<td>After 10 trials, 1 shaping component changed at a time</td>
<td>Encouragement given occasionally (5 minutes)- feedback on client’s performance</td>
<td>Identification of barriers –problem solving obstacles</td>
</tr>
<tr>
<td>Constant therapist involvement</td>
<td>Less therapist involvement</td>
<td>Daily Motor Activity Log (MAL) entries</td>
</tr>
</tbody>
</table>
WHAT DOES RESEARCH SAY ABOUT MCIMT IN CHRONIC STROKE?

“Arm function and arm use in the real world improved significantly even from post-intervention to 1 year after intervention.”

“Improved arm function was strongly associated with the increased amount of use of the affected arm in activities of daily living.”

(Takebayashi et al., 2015)
“Functionally, the subjects were better able to perform some valued activities, including eating finger foods, tying shoes, reaching for and grabbing a cup, and grasping and eating utensil and bringing it to the mouth.”

(Page et al., 2007)

“A 2-week intensive CIMT was associated with increased corticospinal conductivity and significant clinical improvement in the paretic hand function, which, in turn, significantly correlated with the changes in cortical activation.”

(Könönen et al., 2011)
CALVIN COLLEGE REHABILITATION SERVICES MCIMT PROTOCOL

First Session
- Occupational profile & customized assessment battery
- Motor Activity Log

Second Session
- Written contract outlining expectations
- Customized home program checklist

- Tx sessions: 1-2x/wk x60mins, 2-5hrs of unaffected limb restrained 5/7 days/week

Goal:
Overcome learned non-use & promote spontaneous real-world integration of affected UE
Modified Constraint- Induced Movement Therapy Behavior Contract

Patient name: __________________________________________________

On ________ (date) I enter into this behavioral contract with ______________ (therapist name). This contract certifies the following: ____________ (therapist name) will treat me at _____________ (location) on the following days and times: ____________.

These therapy sessions will occur _______ day(s)/week for _______ weeks.

In addition to therapy sessions, my therapist will give me “homework.” This will consist of me practicing activities and exercises that my therapist identifies with my ______ hand. I will be practicing these exercises ______ days a week for _____ hours/day. During these times, I will be expected to wear my sling and/or mitt on my ____ hand/arm to force me to use the ____ hand/arm. Examples of possible exercises that I may practice include:__________.

I am aware that I need to fully comply with the above program to have a full chance at getting some motor function back in the ______ hand/arm. I am also aware that, if I am less compliant with the above program, it is likely that I will be as successful.

If I am not compliant with the therapy program occurring _____ days/week at ___________(name of facility), I have been told that the following consequences may occur:__________________.

If I am not compliant with the home exercise regimen, I have been told that the following consequences may occur: ____________________.

I have read and fully understand this behavior contract.
100% Accountability!

Monitor compliance at the beginning of each session

Identify duration, frequency, perceived exertion, and psychological response to the activities

Problem solve through barriers:

- Recommend adaptive equipment or modify environment to promote success
- Suggest strategies to use in the case of cognitive deficits, tone management, etc…
- Revise functional task list
CASE STUDIES
CASE STUDY 1: EDA

- Date of CVA: April 2012
- Initial Evaluation: February 2017
- How we determined she was an appropriate candidate
- How we introduced mCIMT (education)
- How we ensured compliance (contract, accountability)
EDA’S ASSESSMENT

- Purdue Pegboard – Pin & Assembly Test
- Manual Muscle Test of Shoulder, Elbow, Forearm, Wrist
- Goniometrics of Cervical Neck, Wrist, Digits
- Dynamometry/Pinch Gauge
- Motor Activity Log
- Oculomotor Screen
- Star Cancellation Test
- Randot Stereopsis
EDA’S PREPARATORY TASKS

- Moist heat and kinesiotape to cervical neck
- Cervical HEP
- PIP/DIP Blocking exercises
- Tendon glides
- Flipping cards
- Marble manipulation

- Mancala
- Velcro board
- GRASP Program
- Theraputty
EDA’S MCIMT FUNCTIONAL TASKS

- Pulling up/down pants
- Turning a car key
- Fastening jewelry clasp
- Opening containers
- Buttoning a shirt
- Pulling zipper on pants and coats
- Washing her face
- Applying lotion

- Washing hands
- Manipulation of coins
- Turning on light switch
- Wringing out towels
- Retrieving money from pocket
- Using household tool (screwdriver)
- Turning on/off faucets
- Wiping down counters
## EDA’S OUTCOMES

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Initial Evaluation</th>
<th>Progress Note (4/27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grip Strength (R)</td>
<td>39.8</td>
<td>42.9</td>
</tr>
<tr>
<td>Lateral Pinch (R)</td>
<td>3.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Purdue Pegboard (pin/assembly)</td>
<td>12/13</td>
<td>12/13</td>
</tr>
<tr>
<td>Wrist Flexion</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>Wrist Extension</td>
<td>13</td>
<td>70</td>
</tr>
<tr>
<td>Wrist Radial Deviation</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Wrist Ulnar Deviation</td>
<td>2</td>
<td>39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AROM</th>
<th>Initial Evaluation</th>
<th>Progress Note (4/27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right rotation</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>Left rotation</td>
<td>30</td>
<td>65</td>
</tr>
<tr>
<td>Right lateral flexion</td>
<td>29</td>
<td>44</td>
</tr>
<tr>
<td>Left lateral flexion</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>AROM Flexion</td>
<td>Initial Evaluation</td>
<td>Progress Note (4/27)</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Index MCP</td>
<td>36</td>
<td>84</td>
</tr>
<tr>
<td>Index PIP</td>
<td>70</td>
<td>WNL</td>
</tr>
<tr>
<td>Index DIP</td>
<td>12</td>
<td>48</td>
</tr>
<tr>
<td>Middle MCP</td>
<td>59</td>
<td>91</td>
</tr>
<tr>
<td>Middle PIP</td>
<td>82</td>
<td>99</td>
</tr>
<tr>
<td>Middle DIP</td>
<td>24</td>
<td>52</td>
</tr>
<tr>
<td>Ring MCP</td>
<td>74</td>
<td>WNL</td>
</tr>
<tr>
<td>Ring PIP</td>
<td>78</td>
<td>102</td>
</tr>
<tr>
<td>Ring DIP</td>
<td>35</td>
<td>55</td>
</tr>
<tr>
<td>Small MCP</td>
<td>89</td>
<td>WNL</td>
</tr>
<tr>
<td>Small PIP</td>
<td>90</td>
<td>93</td>
</tr>
<tr>
<td>Small DIP</td>
<td>35</td>
<td>54</td>
</tr>
<tr>
<td>Thumb MCP</td>
<td>40</td>
<td>63</td>
</tr>
<tr>
<td>Thumb IP</td>
<td>0</td>
<td>65</td>
</tr>
</tbody>
</table>
EDA’S FUNCTIONAL OUTCOMES

- increased ease with button fastening
- grasp waist band of pants with RUE to pull over hips
- utilizing right hand to turn off the car, both hands to turn on, & right hand to shift gears
- increased stability in R hand while washing dishes
- “I turned my car on over the weekend without any thought of conscious effort. It was the first time I have done it since my stroke. I really surprised myself.” June 19, 2017
CASE STUDY II: CHARLENE (CHAR)

Date of CVA: 5/26/12
Present Age: 32yo

- How we determined she was an appropriate candidate
- How we introduced mCIMT (education)
- How we ensured compliance (contract, accountability)
## CHAR’S ASSESSMENT

<table>
<thead>
<tr>
<th><strong>Initial Eval (4/3/17):</strong></th>
<th><strong>Progress Note (7/5/17):</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Profile</td>
<td>Box and Blocks</td>
</tr>
<tr>
<td>Goniometrics of Shoulder, Elbow, Forearm and Wrist</td>
<td>Pinch Gauge</td>
</tr>
<tr>
<td>Dynamometry</td>
<td></td>
</tr>
<tr>
<td>Fugl Meyer</td>
<td></td>
</tr>
<tr>
<td>Motor Activity Log</td>
<td></td>
</tr>
</tbody>
</table>
CHAR’S PREPARATORY TASKS

- Initially Mirror Therapy + E-stim
- Kinesiotape spring-assist application to wrist and digit extensors
- HEP: AROM scapula, shoulder, elbow, forearm which progressed to wrist and digits
- Item retrieval of blocks
- Forearm pro/supination with a hammer
<table>
<thead>
<tr>
<th></th>
<th><strong>Initial Eval (4/3/17)</strong></th>
<th><strong>Progress Note (8/14/17)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder Flexion</td>
<td>WNL</td>
<td>WNL</td>
</tr>
<tr>
<td>Shoulder Extension</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>Shoulder Abduction</td>
<td>64</td>
<td>WNL</td>
</tr>
<tr>
<td>Shoulder IR</td>
<td>WNL</td>
<td>WNL</td>
</tr>
<tr>
<td>Shoulder ER</td>
<td>55</td>
<td>74</td>
</tr>
<tr>
<td>Elbow Flexion</td>
<td>132</td>
<td>WNL</td>
</tr>
<tr>
<td>Elbow Extension</td>
<td>-41</td>
<td>WNL</td>
</tr>
<tr>
<td>Wrist Pronation</td>
<td>WNL</td>
<td>WNL</td>
</tr>
<tr>
<td>Wrist Supination</td>
<td>30</td>
<td>WNL</td>
</tr>
<tr>
<td>Wrist Flexion</td>
<td>24</td>
<td>52</td>
</tr>
<tr>
<td>Wrist Extension</td>
<td>36</td>
<td>54</td>
</tr>
<tr>
<td>Wrist Ulnar Deviation</td>
<td>4</td>
<td>WNL</td>
</tr>
<tr>
<td>Wrist Radial Deviation</td>
<td>9</td>
<td>WNL</td>
</tr>
</tbody>
</table>
CHAR’S OUTCOMES – FUGL MEYER, GRIP & PINCH STRENGTH

<table>
<thead>
<tr>
<th></th>
<th>Initial Eval (4/3/17)</th>
<th>Progress Note (8/14/17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugl Meyer</td>
<td>41/64</td>
<td>54/64</td>
</tr>
<tr>
<td>Right Grip Strength</td>
<td>12#</td>
<td>26#</td>
</tr>
<tr>
<td>Pinch Gauge - Lateral</td>
<td>NA</td>
<td>8.8#</td>
</tr>
<tr>
<td>Pinch Gauge – 3 Point</td>
<td>NA</td>
<td>4.4#</td>
</tr>
<tr>
<td>(Modified) Box &amp; Blocks Test</td>
<td>NA</td>
<td>8 blocks</td>
</tr>
</tbody>
</table>
CHAR’S FUNCTIONAL TASKS

- Pulling up pants
- Opening containers
- Washing/drying hands
- Turning on light switch
- Make oatmeal
- Apply deodorant to left underarm
- Brush teeth
- Remove clothes from drawer
- Comb hair
- Open cabinet
- Turn door knob
- Carry weight
- Open refrigerator
- Knock on door
- Wash table
- Fold clothes
- Wring sponge
- Pull chair out
- Wave to greet someone
- Shaving legs and armpits
- Doff socks
- Swiping a credit card
- Item retrieval from purse
- Item retrieval from various height shelves
- Chopping food
- Typing
- Washing mirrors
- Open drawer
- Tucking in shirt
- Pushing the grocery cart
CHAR’S ACCOMPLISHMENT TIMELINE

- 4/6/17: Committed to mCIMT protocol – expectations, contract, checklist
- 4/17/17: Opens refrigerator door independently using RUE only
- 4/20/17: PT notices a “huge change” in her arm and hand
- 5/3/17: Completes downward dog with bilateral arms extended at yoga
- 5/15/17: Manipulates all lever and knob-style door handles in home using RUE only
- 7/5/17: Opens and closes cabinets and drawers using RUE only
- 7/24/17: Shaves left underarm and apply deodorant using RUE only
- 8/21/17: Retrieves item from countertop, sustains grasp on item and puts item away in overhead cupboard
- 9/11/17: Pushes full grocery cart throughout store, retrieves credit card from wallet, swipes card at checkout
- 9/18/17: Utilizes skeleton key to unlock front door at home
SWIPING A CREDIT CARD & TRANSPORTING GROCERIES
FUGL MEYER: HAND TO LUMBAR SPINE (AKA TUCKING IN A SHIRT)
MCIMT LESSONS LEARNED

- Client must be committed
- Client must be disciplined
- Client must embrace occupation-based integration of affected UE into daily living
- Support system
- Progress the challenge
- Benefit of MCIMT in outpatient (or home?) setting
- Insurance considerations

