CONSTRANINT INDUCED MOVEMENT THERAPY (CIMT)

Cherie Henderson and Joanne Martens;
Occupational Therapists
Outpatient Stroke Service
Glenrose Rehabilitation Hospital

Objectives

- Background and Evidence
- Description of Components
- Glenrose mCIMT program
- Further Applications

CIMT

- Derived from behavioral neuroscience research with animals (Dr. Edward Taub’s work with deafferented monkeys)

- Combined with ‘forced-use’ therapy by Steven Wolf (restraint without the ‘massed practice’ component)

- Family of therapies
Improved upper extremity use by two mechanisms:

- Overcoming Learned Non-Use
- Neuroplasticity

Unique Aspects of CIMT

- Focus on transfer to real-world environment
- Extended, concentrated “massed” practice
- Shaping/Task Practice as training technique
- Evidence that it works! (moderate for acute strokes, strong for subacute and chronic – for patients with some active wrist and hand)

EXCITE (Extremity Constraint Induced Therapy Trial)

- Prospective, single-blind, randomized, multi-site clinical trial
- Compared CIMT (6 hour) to usual care
- Published in JAMA November 2006
- 4 years, up to 2 year follow up
- 7 sites, n=227, 32 months post-stroke, minimum 10 degrees wrist ext, 10 degrees thumb abd/ext, 10 degrees extension MCP/IP in 2 other joints (pick up washcloth)
EXCITE

• Statistically significant and clinically relevant improvements as measured by Wolf Motor Function Test, Motor Activity Log (Amount of use and Quality of Movement), and Stroke Impact Scale (Hand Domain)
• MAL & WMFT consistently improved over 24 months
• SIS hand improved immediately post intervention, and 5 other scales continued to improve over 24 months

Family of Therapies

1. Repetitive, task oriented training
2. Behavioral Strategies
3. Constrain use of less affected UE

1. Repetitive, task oriented training

A. Shaping:
• training method of approaching objective in ‘successive approximations’ [grading]
• very regimental approach: ten 30 second trials, continuous feedback, very engaging
• tasks chosen based on movement goals, potential for improvement, patient preference
• goal is not ‘skill acquisition’ but cortical stimulation and overcoming learned non use
• Also called “Adapted Task Practice”
1. Repetitive, task oriented training

**B. Task Practice:**
- functionally based activity performed continuously for 15-30 minutes
- global feedback, measurable
- tasks should be challenging, contextually appropriate (example: folding towels, hammering nails, setting table, virtual reality)

2. Behavioural Strategies

- **A. Behavioural Contract**
- **B. Home Skill Assignment**
- **C. Home Practice**
- **D. Home Diary**
- **E. Motor Activity Log (MAL)**

3. Constraint of less affected Upper Extremity

- Goal is not just restraint of the less affected UE but also encouraging use of the more affected arm through other methods
- Padded safety mitt to be worn up to 90% of waking hours (to be negotiated and contracted between patient and therapist)

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Which factors are most important?

- "FACTORS" experiment examined contribution of individual components to treatment effect
- Traditional patients (20 degrees wrist extension, 10 degrees at IP/MCP each finger)

Factors Experiment (Change in MAL)

<table>
<thead>
<tr>
<th></th>
<th>Repetitive Motion</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(no behavior package)</td>
</tr>
<tr>
<td>Shaping (no behavior package)</td>
<td>.6</td>
</tr>
<tr>
<td>Shaping (with package)</td>
<td>2.1</td>
</tr>
<tr>
<td>Shaping (MAL only)</td>
<td>1.2</td>
</tr>
<tr>
<td>Repetitive Motion (with package)</td>
<td>5.1</td>
</tr>
<tr>
<td>Restraint only</td>
<td>1/8 treatment effect</td>
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</tbody>
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Factors Experiment - Conclusions

- Package alone does not give significant effect
- Concentrated practice on own gives significant but small effect
- No difference between type of practice (shaping vs. repetitive motion)
- Adding package **triples** the effect
- **Adding Behavioral Package to other therapies might improve effectiveness.**
**GRH CIMT Program (Outpatient)**

- offered by Occupational Therapy Service
- 3.5 hours daily for 10 treatment days (with evaluation days before and after, and follow-up)
- initially 2 patients, expanding to 3 patients, running approximately once every 6-8 weeks (September, November, January)
- Combination of shaping and task practice

**Inclusion Criteria**

- Registered in Glenrose Stroke Program (Outpatient or previous Inpatient)
- Active movement: patients must be able to pick up a tennis ball and place on surface approximately 20 centimeters higher, three times in one minute, from sitting.
- Passive movement: no major contractures limiting function
- Able to focus exclusively on UE training for two week period (ie. not requiring other therapies for duration of CI training)
- Motivated and able to comply with the demands of the program

**Exclusion Criteria**

- medical condition requiring monitoring or intervention during treatment day (including administration of medication), unless responsible caregiver present.
- requires assistance to transfer or toilet, unless caregiver present
- unable to tolerate half a day of activity (due to fatigue, pain, concentration, motivation)
- vision or hearing not sufficient to participate in self-rating scales
Exclusion Criteria

- Communication abilities not sufficient to participate in self-rating scales, unless caregiver who is knowledgeable in patient’s daily performance of activities at home present
- Unable to provide reliable yes/no answers
- Unable to follow one-step commands
- Motor and functional impairments not significant enough to warrant intensive therapy

Measurement Tools

- Chedoke McMaster Disability Inventory (Arm & Hand)
- CAHAI (Chedoke Arm & Hand Activity Inventory)
- Canadian Occupational Performance Measure
- Box and Blocks
- Motor Activity Log (Amount Scale)

Case Study

- 51 year old female, left lentiform nucleus infarct in August 2005
- Rehab at Glenrose Subacute, Outpatient, CRIS Program, acupuncture, Spasticity Clinic
- Participated in CIMT September 2007
Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
<th>1 MONTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAL – sens</td>
<td>1.9</td>
<td>3.3</td>
<td>3.3</td>
</tr>
<tr>
<td>MAL – sens/kin</td>
<td>2.0</td>
<td>2.8</td>
<td>3.0</td>
</tr>
<tr>
<td>COPM – sens</td>
<td>2.6</td>
<td>5.4</td>
<td>4.2</td>
</tr>
<tr>
<td>COPM – sens/kin</td>
<td>2.8</td>
<td>3.6</td>
<td>4.4</td>
</tr>
<tr>
<td>BOX/BLOCKS</td>
<td>14</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>BOX/BLOCKS</td>
<td>59</td>
<td>64</td>
<td>57</td>
</tr>
<tr>
<td>CAHAI</td>
<td>23</td>
<td>30</td>
<td>32</td>
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Subjective Feedback

- "It has totally changed the way I think about using my weak arm."
- "I feel like I 'rehired' the arm that I fired after the stroke."
- "Overall, my daily life is so much easier."
- "My body seems more aligned."
- "I saw a lot of improvement in my family member."

Further Applications

- Lower Extremity
- Traumatic Brain Injury
- Pediatrics
- Aphasia
- Further studies ongoing with Multiple Sclerosis, Parkinson’s Disease, Amputee, Phantom Pain
Barriers to Application

- Medical Stability/Acuity
- Potential Detrimental effects
- Variety of rehabilitation needs
- Appropriateness of patients
- Cost and Labor Intensive

CONCLUSIONS

- More evidence of neuroplasticity
- Supported by evidence
- Improves ‘Real World Function’
- CI is not just for Stroke...it is a treatment for learned non-use and correcting abnormalities in brain organization stemming from a number of causes