

Constraint Induced Movement Therapy for the Rehabilitation of Stroke Patients

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'07 Participant Testimonial – Unsolicited Email

- “I played a program on my violin at a senior center today and just had to tell you how I felt. Before my stroke 4 years ago, I never had to worry about how I was holding my bow – it was always natural. I was about half way through my program and all of the sudden I noticed that my bow hold was perfect, I wasn’t correcting it all the time, and my bow was nice and straight going across my violin. Not to mention, no scratching noises. Everything was just fluid. Only a few people noticed my big smile during the song. But it was enough that I know it felt good again. Nice strong bow strokes, and confident playing. It’s been so long since that’s happened.” --
Esther

Seminar Objectives

- Identify how Constraint-Induced Movement Therapy (CIMT) works: Unmodified and Modified Approaches
- Assess motor performance and functioning level to determine ideal candidates for participation in a variety of health care settings.
- Recognize the indications, contraindications and precautions employed w/CIMT.

Seminar Objectives - continued

- Identify how commonly used neurorehabilitation treatment techniques compliment this “vehicle”.
- Understand pragmatic measurement and evaluation tools.

EBP

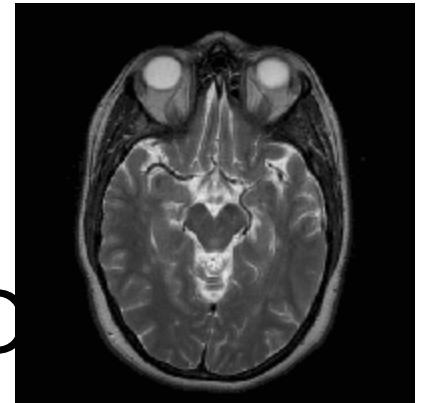
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- Van Peppen, R., Kwakkel, G., Dauphinee, S. Hendriks, P., Van der Wees, P. & Dekker, J. (2004). The impact on therapy on functional outcomes after stroke: What's the evidence? *Clinical Rehabilitation* (18)8, 833-862.

EXCITE STUDY

- Wolf, S., Winstein, C., Miller, P., Taub, E., Uswatte, G., Morris, D., Giuliani, C., Light, K. & Nicols-Larsen, D. (2006). Effect of constraint-induced movement therapy on upper extremity function 3 to 9 months after stroke. *JAMA*, 296, 2095-2104.

Therefore...

- “Healing is a matter of time, but sometimes it is also a matter of opportunity.” -- Hippocrates
- Thus the pitch for CIMT and ** C moment in history is NOW** as rehabilitation professionals.
- brainconnection.com



Program Success?

- While understanding how CIMT works and choosing the right candidates for participation are foundational to this model, the most critical element for success are the *intervention skills of the clinician*. It is this that is sorely lacking within the CIMT literature.
- The evidence does not strongly support traditional therapies but the evidence does when combined with duration and intensity within this model.

So what will you learn today?

- Specific Learning Objectives
- Identify what Constraint Induced Movement Therapy (CIMT) is and how it was developed.
- Determine how CIMT works based on the concept of cortical reorganization.
- Recognize how modified CIMT differs from the original structure.
- Analyze motor performance, function and the client's level of motivation to determine if CIMT should be used.

Continued – specific learning objectives

- Integrate current neurorehabilitation methods, such as PNF and Brunnstrom, into this model.
- Assess motor performance using adapted versions of the Motor Activity Log, Graded Wolf Motor Function Test and Fugl-Meyer Evaluation.
- Analyze peer-reviewed evidence supporting the effectiveness of CIMT.

Theory and Background

- CIMT is a technique that supports the use of traditional neurorehabilitation and motor recovery therapies, in which constraint of the non-affected upper extremity, combined with repetitive use of the affected upper extremity, works to improve motor recovery and subsequently function and performance. CIMT helps a client overcome forced nonuse and at the same time helps the patient train the affected upper extremity.

CIMT AKA “TAUB Therapy”

- Credit must be given to Edward Taub, PH.D.
- Dr. Taub is the Director of the Taub Therapy Clinic and the “originator” in the 1980’s of this model which incorporates traditional motor recovery therapies. Dr. Taub’s contention is, based on his extensive research, that anyone with long standing weakness on one side of the body nearly always benefits from this approach.
- He is a psychologist with the University of Alabama/Birmingham.

Early Taub Experiments

- Why can a stroke be so debilitating even in the clients who “renew” their ability to use their affected limb?
- Why is there a phenomenon that those who have renewed their ability to use their affected limb still choose not to use that limb as they once did?
- If function is restored, why isn't the action?

Continued - Taub

- Taub and his colleagues set out to answer the aforementioned questions.
- A series of experiments on monkeys were conducted.
- (Knapp, Taub, Berman, 1958 & 1963)
- (Taub, Bacon, Berman, 1965)
- (Taub, 1977)

Taub – Furthermore...

- Experiment “#2” as a result of the effects noted from experiment “#1”:
- Using monkeys, they sought out how to prevent the learned non-use phenomenon...(explain)
- Follow Up: APMR, 1993 – 9 pts > 1 yr post CVA; same intake criteria; attention-control group PROM/home use; TX Home CIMT; Support for motor learning – gains reeval’ed after 2 yrs. maintained

So what about all these experiments?

- They support the hypothesis that a decline in function and performance may not be due to the change in context/contextual interference (generalization) but instead or also due to this phenomenon of diminished limb recognition in the brain. (Explain)
- A cascade of events leads to learned disuse.

Key Taub Terms

- In trying to foster behavioral change, plasticity changes occur with this intensive rehabilitation model resulting in improved motor control and performance...and motor learning

Continued - terms

- Constraint Movement
- Massed Practice
- Shaping/Forced Use: approach of a desired outcome in small, successive increments.
- Adaptive and standard task practice
- Learned Non-Use
- Positive Reinforcement (faded)

Unmodified v. Modified CIMT

- Unmodified is a treatment model that uses a variety of motor control approaches to promote the affected limb for 90% of the individuals waking hours.
- Only activities involving toileting, hygiene (at least weight bear) and bathing or an activity which would be dangerous if the other limb was not used are “permitted”.
AM eating – doc use of UE.

continued

- This is done by constraining or reducing the use of the unaffected extremity for 2-3 weeks.
- Constraints of the UE are that of a sling, mitts with velcro or resting hand splints.
- Taubtherapy.com

Modified CIMT – The Clinical Reality for Many Therapists

- Modified CIMT may be for many clinicians and even participants, a more pragmatic model.
- The program consists of 3 hour/day sessions @ 5 days/wk. for a minimum of 4 successive weeks (20 sessions totaling 60 hours)
- The client is expected to use his/her affected extremity for a minimum of the five “top arm use hours” at home during each week day. 1-1.5 hr formal H.P. (green bag)
- Pierce et al. (2003). *Neurorehab Neural Repair*
- Page et al., multiple studies.

modified CIMT

- 30min. Of OT/PT, TIW x 10 weeks
- During this time, the patient wears a restrictive device for 5 hours, 5 days per week when they most frequently use their UE.
- Nudo et al. (2003) *J Rehabilitation Med*,
Page et. al. (2002) *Clinical Rehabilitation* –
low level evidence; perhaps the best
evidence for the “acute” factor.

Modified CIMT

- Modified protocol #3
- A Randomized Controlled Trial of mCIMT for Elderly Stroke Survivors: Changes in Motor Impairment, Daily Functioning, and QofL.
- Archives of PMR, Vol 88, March 2007.
- Wu, C., Chen, C., Tsai, W., Lin, K. & Chou, S.

Unmodified Treatment – The Theoretical Ideal

- Direct intervention for 6-8 hours/day @ 5 days/wk. x 2-3 weeks.
- Weekends, 3-4 hrs. of specific tasks (HP) and w/ADL
- Participants, as with modified CIMT, keep a notebook relative to what each individual day outside of therapy involves (relative to arm use)
- Therapist/Clinician takes on the role of *Coach*, *Encourager* BUT expert *Clinician* too.

Sources

- Van der Lee et al. (1999). *Stroke*.
- Porter, K. & Lord, S. (2004). *NZ Journal of Physiotherapy*.
- Levy et al. (2001). *Am J Phys Med Rehab*.
- Kunkel et al. (1999). *Arch Phys Med Rehab*
- Gillot et al. (2003). *Am J Occ Therapy*.

Reimbursement

- As with Taub's clinic, most individuals are self-pay. Especially with the Unmodified approach.
- Since it is not the Model but the intervention that one is billing, clinics and other health care settings may bill it under traditional neurorehabilitation codes, provided a prescription, etc. Often this is done with the Modified CIMT approach.
- Some trends, regardless of pay, are such that some facilities are developing CIMT programs in tandem with Industrial Rehab Programs.
- ...Use of Aides...Other ancillary staff, rec therapists...

Marketing

- Launched this by getting on the grand rounds at large local hospital.
- To PM & R physicians and family doctors.
- To PT/OT - They're advocates.
- Support Groups – Stroke

Applicability to Outpatient

- Pierce et al. (2003) found that the forced use component of CIMT in conjunction with a home program may be used in traditional outpatient settings.
- Furthermore, Page et al. (2004) found that repeated task-specific practice (shaping/repetition) is more critical than intensity in improving function.

Continued

- My experience -- typically team up a modified with an unmodified CIMT client or high and lower functioning client = therapists' typically take on only 2 clients at a time.
- This is dependent on the level of the client.
- There can be benefit to a larger program where both group and individual programming can take place.
- Discuss Group Programming Model – pros and cons

Applicability to Inpatient Rehab

- Discussion
- Pioneers
- earlymedicalpioneers.com

Applicability to Sub-Acute/SNF

- Discussion

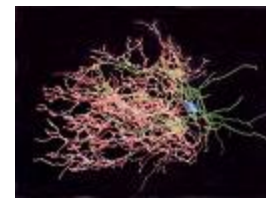
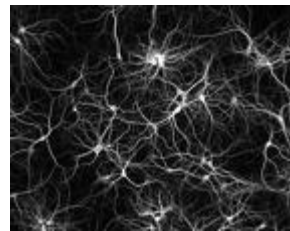
Why CIMT Works – In Short

- Cortical Reorganization
- Dendrite branching – new connections
- Redundancy
- Synaptic strength
- brainquest.com



The Short - continued

- Obviously, due to the motor deficits as the result of the stroke, the client relies on their unaffected upper extremity...
- Problematic: *Neurons that fire together, wire together.



The Short - continued

- When the extremity associated with those neurons are not used, the neurons are used by the brain for other functions. Much like development of the brain during the critical periods in infancy, toddlerhood, and childhood.
- In essence, the goal is to rewire (new paths, dendritic branching) the hardwiring (synaptic intensity) of the motor and sensory centers of the brain. +*Neurons that fire together, wire together.

Other Views

- CIMT is also based on the principles of DNS theory and a T-O approach (Gillen & Burkhardt, 2004)

Continued

- CIMT has shown evidence of neuroplasticity 21 years after the occurrence of a stroke (Beasley and Check, 2000)

Motor Learning and Motor Control

Still on 'why' CIMT works

- The 3 major aspects of motor learning (a permanent change in function) involve environmental conditions, cognitive processes and movement organization (Jarvis, 1994).

Continued

- As clinicians, we practice this through:
- Provision of (Positive) Feedback (Extrinsic) -- for Opportunities to practice (motorically correct!) – results in improved synaptic activity and those long term potentials of the pathways (Asanuma & Keller, 1991).

Motor Learning - continued

- Involves 2 stages:
- Acquisition or practice stage (relearning) and a retention and transfer stage (information is stored for retrieval and application to novel situations)
- The acquisition stage may indicate performance but it is the retention and transfer phase which is indicative of learning (Magill, 1989; Sage, 1984; Schmidt, 1988, 1999)

Continued

- Motor Learning Strategies for these clients (Hanlon, 1996; Hsieh et al., 1994; Magill & Hall, 1990; Page et al., 2001)...
- Active participation clearly promotes learning.
- Contextual Interference promotes retention and transfer of a skill.
- Blocked/constant/part whole practice is of low contextual interference but good at strengthening the synapse.
- Random/variable practice, because it requires the learner to regenerate solutions, is more effective for retention and is generally considered to be more effective for hemiparetic motor learning.

Continued

- Some clients with stroke demonstrate difficulty mastering tasks during the acquisition phase of learning if random practice is the sole method.
- Bottom-Up Approach= \rightarrow blocked (rote, over and over) \rightarrow variable (random) \rightarrow whole (functional) practice
- Top-Down Approach= \rightarrow Whole/functional practice with variable/random practice offering high contextual interference.

Continued

- Mental practice can be employed as a vital component to improve motor function.
- Added meaningful occupation enhances motor performances by promoting purpose and motivation.

When CIMT Works

- Indications:
- Client and family motivation
- Generally good health and activity level
- Brunnstrom stage 4-6
- Sub-Acute (6 months post stroke; traditionally, at 6 months that is what one is left from a prognosis standpoint)
- EXCITE STUDY – massed practice safe at 3 months.
- Those with Chronic Hemiparesis

Continued - Indications

- Client should be ambulatory without an assistive device secondary to safety...capacity to walk 25 feet several times a day. Balance assessment...
- Independent sit/stand
- Able to follow verbal and written direction.
- Eager family or care provider.

Contraindications

- <Brunnstrom Stage 4.
- If Brunnstrom Stage 4 in the hand but 1-3 proximally, I view this as guarded and typically advise client from this model of programming.
- Acuteness: Debow (2004). *Stroke*. noted that in a study involving rats, researchers found that immediate constraint of an affected limb *with massed practice* after a stroke caused hyperthermia and aggravated the brain injury. And yet another source in the peer reviewed literature....(discuss Dromerick et al.)

Contraindications – cont'd

- Stroke, 2000: Dromerick, Edward and Hahn
- Looked at CIMT in acute ischemic CVA.
- Supported 'CIMT' which was defined as constraint of the affected UE but only done for 2 hrs./day.
- If the concept of massed practice is manipulated (less intense, ex. 2 hrs./day), CIMT is safe for acute CVA but no evidence to support it as any better than other therapy

Precautions

- Monitor
- A lot against gravity – be vigilant about the onset of any shoulder tendinitis – this is a big reality! (Pierce et al., 2003)
- Fatigue with massed practice

Baseline Motor Performance

- Brunnstrom Stage 4 at minimum
- Specificity:
- Wrist extension to 10 degrees
- MCP and IP joint extension of the thumb and at least 2 additional digits 10 degrees in extension.
- The client should be able to actively complete the above 3 different times in one minute (Blanton & Wolf, 1999)

Continued

- Other:
- Wrist extension to some degree, thumb abduction and at least extend 2 fingers to a minimum of 10 degrees.
- Be certain wrist flex is not used to provide digital extension.
- Lift wash rag off a table using any type of prehension then actively releasing it.

Continued

- ACTIVELY...
- Shoulder flexion and abduction and external rotation 45 degrees each
- Partial elbow extension
- Forearm supination/pronation 45 degrees each

Client Medical History

- No uncontrolled medical issues.
- No chronic conditions which could be aggravated.
- Physician approval mandated.

Patient Motivation and Commitment

- ‘Readiness Counseling’ as my part of the intake interview. Padilla (2000) talks about being and becoming in the process of rehab.
- Occupational readiness: what is it *you* want to improve? Story of 19 y/o vs.....’tree surgeon...computer technician
- Are you here because you want to be here
- Educate on the commitment and intensity
- Involve the family

Client's Support System

- Willing to provide support to assist as necessary but to also back away as role of caregiver – remember the constraint is used 90% of the waking hours.
- No support v. dependency continuum...
- Taubtherapy.com: Noted a study that 70% of those who gave up work to care for a family member returned to work after the family member received Taub training.

How CIMT Works

- Bottom Line...
- Motor Control Therapy:
 - 1. Manipulation of the sensory mechanisms results in motor output.
 - 2. *Repetition* of the sensorimotor cycle will enhance voluntary movement.
 - 3. Use of therapeutic movement needs to be *practiced*.

Continued

- Some basic premises to keep in mind (taken from the Neurodevelopmental Frame of Reference):
- Consider foundational skills as a foundation to make normal skill acquisition possible (foundational skills – midline symmetry, trunk rotation, postural control).
- Cannot impose normal movement on abnormal muscle tone. Coaching in CIMT terms!

Neurophysiological Principles – Structure and Functions

- CNS – Muscle Spindle Activity/Golgi Tendon Organs –
- Functions:
- Both the m. spindle and the GTO are responsive to tonic and phasic stimuli.
- One will use techniques to effect the MS or GTO depending on what one is trying to achieve....to inhibit, to facilitate or both.

Continued

- The neuromuscular treatment techniques will affect the phasic and tonic responses in the mm.
- A phasic response is quick and short-lived contraction, reflexive in nature (ex. Quick stretch and tapping)
- Phasic provoking stimuli are often used in early motor control therapy.

Continued

- A tonic response involves a sustained contraction of a muscle via controlled sensory input.
- Tonic provoking stimuli are often used, such as with sensorimotor and Rood techniques, ex. Vibration, functional task performance.
- Essentially skilled movement, normal activity requires integration of tonic and phasic movements.
- As CIMT treatment proceeds, tonic activity is the emphasis.

Continued

- The MS and GTO are also sensitive to facilitation and inhibitory techniques. Ex. GTO/MS – Deep Pressure is inhibitory and tapping is facilitatory.

Facilitation and Inhibition

- Contraction of a muscle – facilitation
(hypotonicity/antagonist)
- Relaxation of the muscle tone – inhibition
(hypertonicity/agonist)
- Example: Biceps: Quick Stretch will facilitate
and a slow prolonged stretch will inhibit.
Typically one is trying to facilitate the extensors
and inhibit the flexors when attempting to
balance tone.

Continued

- Group One and Group Two Muscles:
- Group I: Flexors, Adductors and Medial Rotators
- Group II: Extensors, Abductors and Lateral Rotators
- Spasticity often attacks the Group I muscles.
- With spasticity, the mm lose their dynamic ability to produce isolated joint movement and mm tend to work in a bound unit or synergy.

Continued

- With spasticity, reciprocal innervation is lost.
- Therefore, facilitation methods are frequently directed toward the Group II muscles (extensors...) and inhibition toward the group I muscles.
- Ex. RIP the Group I mm (Bobath) and use the controlled sensory input with the Group II's (Rood)

Continued

- An extensor synergy would be the opposite of what was just described.
- Facilitation of the flexors when spasticity is present will only make it worse.
- Facilitation of the flexors will also further inhibit the extensors (aka antagonist), which is obviously not good.

1st Step Co-Contracture

- Simultaneous contraction of the agonist (prime mover) and the antagonist.
- This is a goal with motor control therapy with hypo or hypertonicity
- Stability before mobility
- Need proximal co-contracture (balance of muscular tone around a joint) for distal mobility (reciprocal innervation)

2nd Step – Reciprocal Innervation

- Ultimate goal with isolated movement patterns.
Ex. PNF UE Diagonals
- With hypertonicity, one is trying to obtain a balance between the Group 1 and Group 2 mm. so isolated functional movement patterns occur.
- One does not want the antagonist resisting the agonist, otherwise get synergistic non-isolated movement. Try to get the mm. working independently of one another so skilled isolated motor control can occur.

CIMT Treatment

- In client treatment, the extensors should be facilitated before permitting or focusing on flexor activity; Ex. (provide example with functional reaching tasks).
- The activity of the Group II mm. is the key to functional attainment of movement at all levels of required activity.
- Inhibit agonist hypertonicity and facilitate antagonist hypotonicity. Or if an extensor synergy exists, inhibit the Group II's and facilitate the Group I's (Ex. At the elbow).

All theoretical Approaches are the again based on...

- Manipulation of the sensory mechanisms (sensations) results in motor output.
- Repetition of the sensorimotor cycle (input→output) will enhance voluntary movement.
- *Use of therapeutic movement needs to be practiced, and practiced **the right way**.
- Emphasize quality – practice doesn't make perfect, perfect practice makes perfect.

Continued

- Work developmentally, proximal to distal, reflexive to voluntary to refined movement.
- Volition
- Long Term Memory is searched – previous learning (Use familiar tasks rather than new learning)
- Movement is executed and through practice and repetition it is monitored and adapted
- The Program is stored in memory for future use. (learning and generalization)

Continued

- Meaningful occupation is important for the most practical movements are most embedded in memory.
- Therapy and learning involves practice and repetition (rote to meaningful). The incorporation of home programming with CIMT is critical (repetition; variable practice); Using improved motor skills within customary roles and routines.

Continued

- Goals of all Motor Control Approaches:
- Maintain ROM
- Normalize M. Tone
- Normalize Movement – avoid reflexive and synergistic motions and positions and primitive reflexes in CIMT

Relearning functional motor patterns

Proximal stability before good distal mobility
– following a developmental sequence is often a good guide.

Developing automatic motor movement requires practice, practice and more practice.

Once voluntary control is obtained consistently, work on endurance, speed and accuracy.

Facilitation Techniques

- Ways to increase tone:
- Early phase – “jump start”
- Tactile Stimulation for CIMT: quick swipe/light stroking or fast brushing – use few reps for mobility (phasic) and more reps/more frequent/sustained stimulation for stability (tonic). This often precedes task-oriented and other functional approaches.

Continued

- Thermal Stimulation: Icing
- Proprioceptive Stimulation: Vibration, stretch, quick light passive stretch followed by brief phasic responses; prolonged stretch; stretch pressure over m. belly (thumb and fingers in direction of muscle fibers), and tapping.

Continued

- Reflexes are not used in CIMT unless Brunnstrom 4 or greater function but lack scapular elevation or even forearm rotation. May consider using associated reflex.

Inhibitory Techniques

- Techniques for decreasing tone:
- Tactile Stimulation – slow stroking (extensor tone)
- Thermal Stimulation – prolonged icing, heat
- Vestibular Stimulation –slow rolling
- Proprioceptive Stimulation – vibration at low speed; positioning (RIP's): light joint compression; pressure over insertion of tendon.

Continued

- Need willed movement – visually attend

Specific Sensorimotor Approaches

Proprioceptive Neuromuscular Facilitation
(PNF)

Herman Kabat, a neurophysiologist and
Maggie Knott, a PT

A lot of facilitation, not inhibition

PNF Principles

- Emphasizes abilities rather than inabilities
- Normal movement development precedes proximal to distal

Continued

- ...Developmentally, movements of flexion and extension, then flexion, the diagonal and spiral functional patterns follow.
- Isolated movements to normal functional movements, such as washing one's face. (Blocked practice to whole practice)
- Goal directed (functional movements) are made up of reversing movements, Ex. Reach into a refrigerator and reach out...get balance of agonist and antagonist...reciprocal innervation.

Continued

- Developing motor behavior, there is an orderly developmental sequence of total movement postures, ex. Can't teach to sit, if cannot roll and so on.
- Normal motor development is orderly and sequential but lacks step by step quality.
- Improvement of motor ability is dependent on motor learning – go from simple motor tasks to more complex voluntary acts (low contextual to high contextual interference).

Continued

- Need practice, or frequency of stimulation, and repetition of activity for motor learning.
- Need to use goal directed activity and not just rote exercise or movement. Tap into the association areas of the brain where motor output and purposeful movement come together.

PNF Treatment Procedures

- Diagonal Patterns, D1 and D2...
- --emphasize these because motor development proceeds this.
- Five reasons why diagonals are used:
 - - patterns agree with spiral and diagonal characteristics of normal movement.
 - - voluntary movement consists of mass movement patterns rather than individual mm.

Continued

- - Diagonal movement occur last in the developmental sequence and is the most advanced movement. Must have good diagonal movements to function.
- - All diagonals cross midline – good for perceptual motor function and interaction of both sides of the body.
- - Diagonals incorporate a rotational component.

Other PNF Selected Procedures

- Manual contacts
- Vision
- Verbal Commands
- Stretch – Quick
- Approximation and Traction to stimulate joint proprioceptors (use one or other depending on muscle tone)
- Resistance (rowing)
- Rhythmic Stabilization – alternating isometric contractions of agonist and antagonist – grade to achieve cocontracture for stability
- facilitate concentric and eccentric contractions --

Neurodevelopmental (Bobath) Approach

- Karl and Berta Bobath
- Principles:
- Handling
- Positioning
- Use of Adaptive Equipment
- Key Points of Control
- Use of Sensory Input

Continued

- Motor Learning Strategies
- Encourage Voluntary Control
- Encourage total body integration, bilateral UE usage, crossing midline and facilitate the affected side (weight bear during AM ADL; proper mobility).

Neurodevelopmental Concepts

- During the acquisition of functional motor skills, the therapist encourages the individual to focus on the goal rather than specific movement components of the task.
- Learning and adaptation of motor skills involves practice (experience) & repetition.
- Do not feed into spasticity

Continued

- RIP's; opposite of synergy pattern; facilitate scapular protraction, isolated elbow extension, etc.
- Work on affected side of the client
- Use good bed mobility, supine → sidelying — sitting...

Neurophysiological/Rood Approach

- Margaret Rood
- Development to include co-contraction and reciprocal innervation through controlled sensory input.
- Discussed motor performance with phasic and tonic terms
- Uses inhibitory and facilitory techniques
- Heavy work as inhibitory
- See previous motor control discussion

Brunnstrom Movement Therapy

- Signe Brunnstrom
- 6-7 Stages of Recovery, depending on source
- Some treatment strategies may be 'considered outdated' (based on stage of recovery and other factors) in early treatment especially with those who have expected good prognosis for motor recovery.

Continued

- Primitive reflexes produce responses in mm – perhaps use in treatment selectively
- Uses sensory input (vibration, stretch, etc.) and exteroceptive input such as pressure, temperature and touch.
- Necessary to use motivation; visual feedback.
- Necessary to use repetition.

Recovery Stages

- Trunk: Stability before mobility
- Goal is to get voluntary control of the synergy pattern
- Use synergies, reflexes (I do very selectively...)
- Bilateral rowing for isometric, isotonic, concentric and eccentric m. contractions.
- Visually attend

Continued

- UE Stages 4-5 (CIMT candidates!)
- Goal: **Promote voluntary movement which deviates from the synergy...trying to facilitate isolated control
- Developmental: Spherical and cylindrical and gross grasp → lateral prehension.
- **Treatment deviates from synergistic patterns – uniplanar to more complex movement.

Continued

- Stage 6: Work on strength (not so much tone issues), endurance, speed and precision and all forms of prehension (within context!)

Task Oriented Approach and Functional Training Approaches

- Normal functional movement emerges as an interaction among many systems
- Individuals attempt to solve problems inherent in a functional task rather than just repetitively practicing normal tasks.
- In context and variable/whole
- Transfer of training – involve caregivers – important part of home programming

Continued

- Top down v. Bottom up

Affolter Approach – (altered)

- Guiding Principles – “to produce normal movement one needs to feel what normal movement feels like”.
- Used in tx and lunch. Used with STP.
- Traditionally used for perceptual-motor dysfunction
- Used when client at Brunnstrom 4 stage when isolating each motion but needs assistance when collectively putting all the motions together with a functional task.

Overall Approach with CIMT

- Focus on practicing the missing or problematic performance skills; practice the whole task and transference to generalized situations. Home Program important.

Pragmatic Measurement and Evaluation

- Use of customary assessments of P/AROM, muscle tone and perhaps strength. In addition to sensation and pain, etc. The chronic shoulder often demo's decreased PROM proximally.
- Timed Functional Motor testing of the UE are helpful
- Checklist measures which identify quality and quantity of arm use are helpful.
- MiniMental may be used as a screen (24/30)
- Visual Perceptual and other cognitive evaluations as well.

Question

- Brunnstrom 4
- AIM → 1/5 Quantity indicating Learned Disuse.
- Approach?
- A. High Contextual Interference
- B. Low Contextual Interference
- C. Shaping
- D. B & C

Question

- Brunnstrom 4
- 1-week into the program you wish to begin a more functionally-oriented approach. Client has difficulty putting collective movements together into any purposeful action or pattern. Specific Approach?
- A. NDT
- B. Rood
- C. Affolter
- D. PNF

Question

- A. High Contextual Interference
- B. Low Contextual Interference
- _____ Blocked practice
- _____ Shaping
- _____ Standard Task
- _____ Part Whole practice
- _____ Adapted Task

Continued

- _____ Variable practice
- _____ Random practice
- _____ Top-Down approach
- _____ Bottom-Up approach

Question

- Given the lack of EBP protocols regarding use of CIMT in “acute phase”, what do we need to perhaps manipulate if CIMT is elected as the form of intervention?
- A. Constraint
- B. Massed Practice
- C. Forced Use
- D. Tighten Up the Constraint

Review of more Evidence RCT's

- Van der Lee et al. (Stroke, 1999)
- Observer-blinded randomized clinical trial of 66 patients with chronic stroke. Randomized to 2 weeks of CIMT or a comparison of equally intensive *bimanual training based on 2 weeks of neurodevelopmental therapy. After 1 wk., significant diff. in the CIMT group.

continued

- Page et al. (2001)
- Modified CIMT in outpatient setting – more consistent with scheduling and reimbursement
- 6 patients in subacute phase, those exhibiting learned non-use.
- 2 patients received ½ hr PT and OT TIW for 10 wks while they simultaneously had

continued

- Their unaffected arms and hands restrained for 5 days/wk. for 5 hr/day identified as times of frequent use
- 2 pts received regular therapy
- 2 pts received no therapy
- Those in the mCIMT program had substantial gains with the other 2 groups demonstrating no gain

continued

- Dromerick, Edwards and Hahn (Stroke, 2000)
- Questioned whether CIMT could be implemented in the acute CVA population (2 wks post stroke) and whether this would be more effective than traditional therapy (control group)

continued

- 23 subjects, randomized controlled trial that compared traditional therapies to CIMT.
- Both groups received the equivalent time and intensity of direct treatment – 2 hours/day, 5/days/wk for 2 consecutive weeks.
- 20 subjects completed the trial.

continued

- No subjects withdrew because of pain or frustration
- No statistical difference in ADL performance but some tests did lean toward CIMT
- Conclusion: Acute rehab is feasible: CIMT is associated with less arm impairment overall. More research necessary.

continued

- Liepert et al (Stroke, 2001)
- Monitored 13 pts with chronic stroke for a 12 day period of CIMT.
- Findings: Focal Transcranial Magnetic Stimulation)
- Before tx, the cortical representation area of the affected hand muscle was significantly smaller than the contra side.

continued

- After treatment, the m. output area of the affected hemisphere was significantly enlarged, corresponding greatly to improved motor performance of the paretic limb.
- Shifts of the center of the output map in the affected hemisphere suggested the recruitment of adjacent brain areas.

continued

- At 6 months follow up, showed motor performance remained at high level – also, the cortical sizes in the 2 hemispheres became almost identical.

continued

- Taub (APMR, 1993)
- 9 patients with chronic (post 1 yr) hemiplegia
- Same intake criteria
- Control group – attention-focused (PROM and no restraint)
- Tx group -- CIMT

continued

- Conclusion: tx group demonstrated significantly improved performance speeds, increased quality of movement and increased ability of the UE in ADL.
- After 2 yrs, in support of motor learning, these gains were maintained, if not improved.

continued

- Wolf (1989)
- 25 patients with chronic minimal to moderate extensor function.
- CIMT – significant changes in 19 of 21 tasks with most changes lasting for at least one year after tx.

continued

- Wolf -EXCITE
- Federally funded study, presented at the National Stroke Association Conference –
- He and researchers at 7 other medical centers around the nation randomly assigned 222 people who suffered moderate strokes in the previous 3 to 9 months to get standard rehab or CIMT,

continued

- ...either right away or a year later.
- Researchers are still analyzing whether those who got treatment a year after their CVA improved as much as those who got it sooner. This has insurance implications.

continued

- Research by van der Lee, et al. (1999), Pierce, et al. (2003), Porter & Lord (2004), Page, et al. (2002), Levy et al. (2001), Kunkel, et al. (1999), Gillot, et al. (2003) and Page, et al. (2003)
- Based on the studies to date, it seems that more hours of shaping/therapy and more hrs spent wearing a constraint ...

continued

- ...Resulted in a higher mean improvement within various standardized assessments.
- Nevertheless, both CIMT and mCIMT are effective in improving function.

A Review of the Literature

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