



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

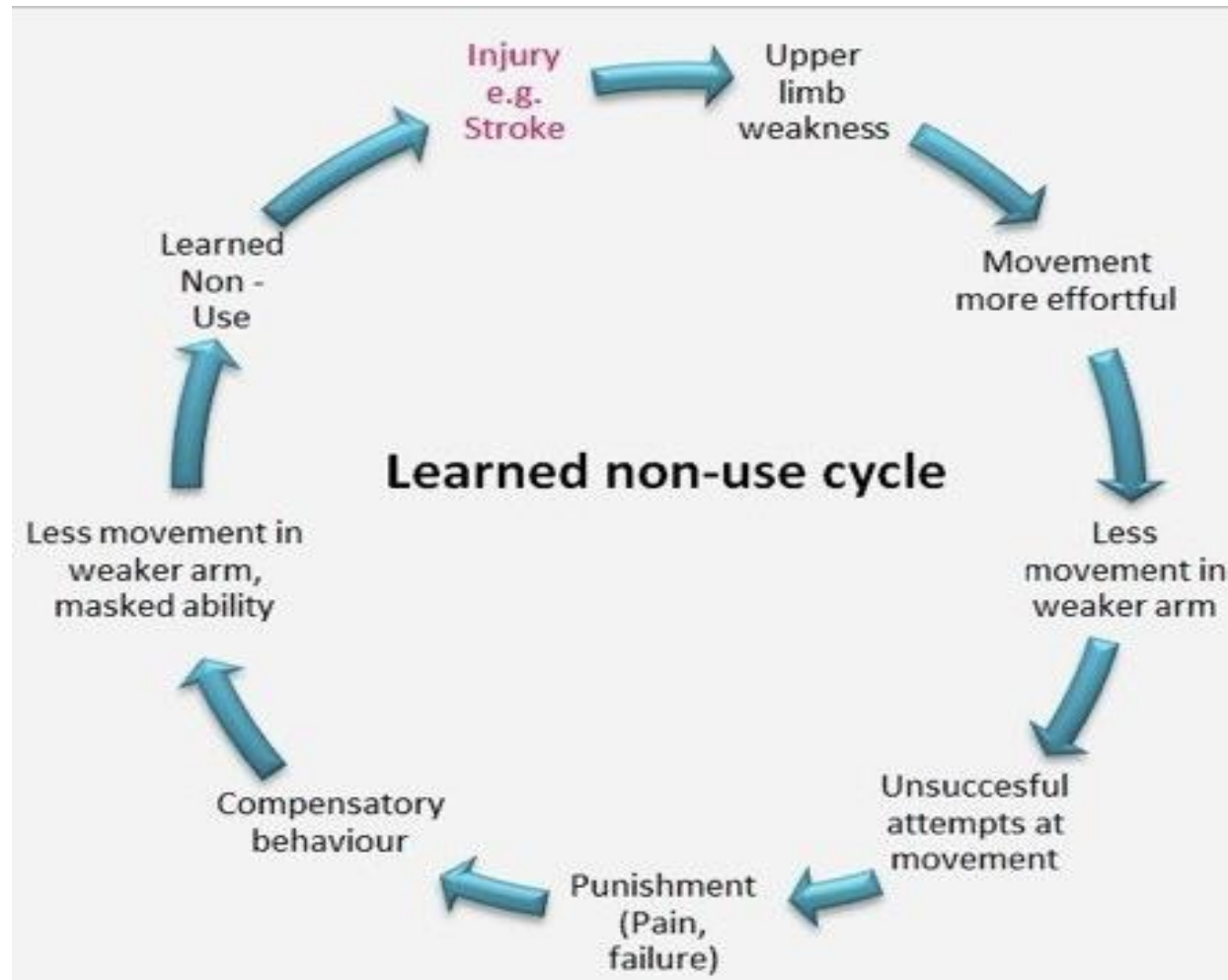
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# COURSE OBJECTIVES

- 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  $\geq 2$ )
- ✓ Adequate balance & walking ability while wearing the restraint
- ✓ Brunnstrom Stage  $\geq 3$
- ✓ Some hand function:
  - ▶ 10 degrees of wrist extension
  - ▶ 10 degrees of thumb abduction
  - ▶ 10 degrees of finger extension (any 2 other digits)

Advances in Constraint-Induced Movement Therapy



# TYPES OF RESTRAINT



# TRADITIONAL CIMT COMPONENTS

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

# 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)

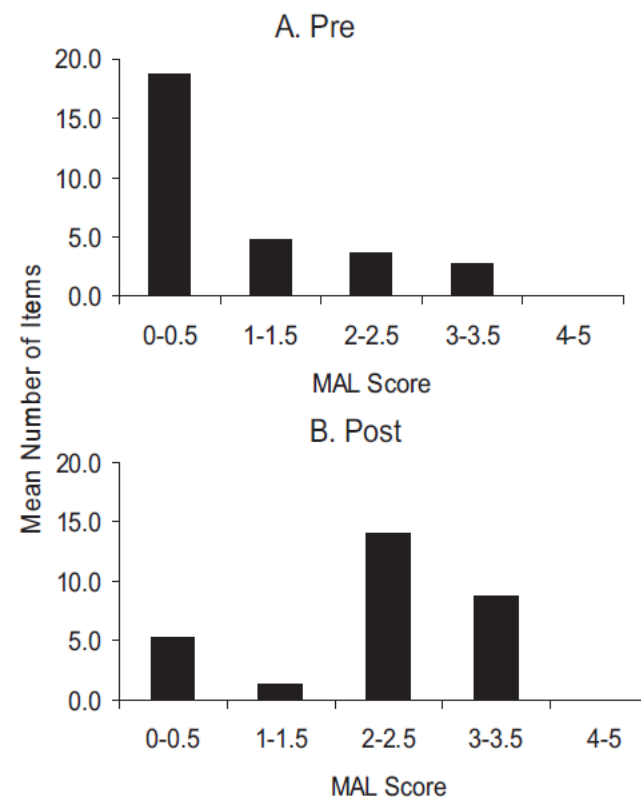


Fig 2 Number of grade 4/5 MAL items with low (0, 1) and moderate (2, 3) arm-use scores before (A) and after (B) treatment. Note. The total number of items was 30. Scale: 0 = no use, 1 = very poor use, 2 = poor use, 3 = half as good use as prestroke, 4 = almost normal use, 5 = normal use.

(Taub et al., 2013)



## WHAT DOES RESEARCH SAY ABOUT MCIMT IN CHRONIC STROKE?



“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.

## CCRS – EMPHASIS ON “TRANSFER PACKAGE”

- 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

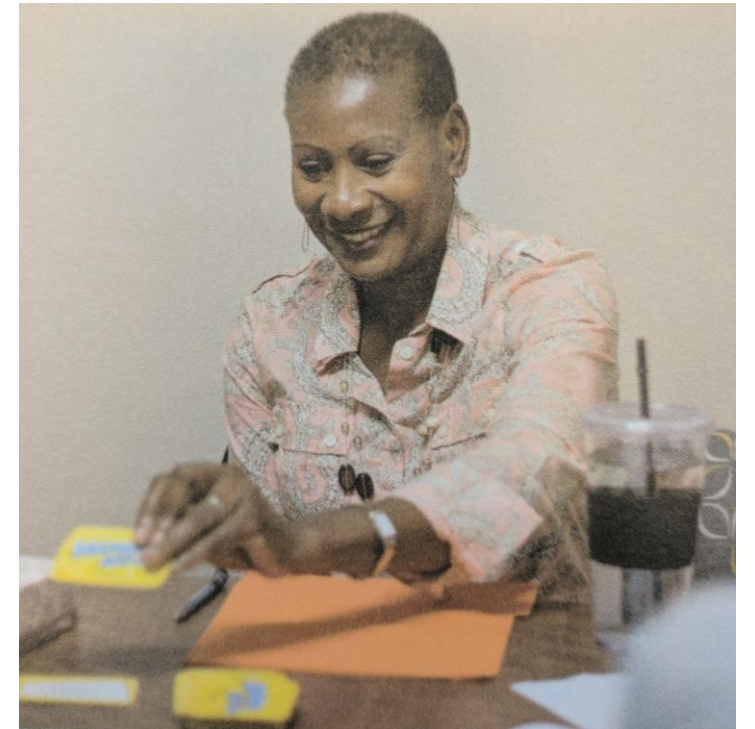


# CASE STUDIES



## CASE STUDY I: 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

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

AROM	Initial Evaluation	Progress Note (4/27)
Right rotation	12	50
Left rotation	30	65
Right lateral flexion	29	44
Left lateral flexion	32	50

<b>AROM Flexion</b>	<b>Initial Evaluation</b>	<b>Progress Note (4/27)</b>
Index MCP	36	84
Index PIP	70	WNL
Index DIP	12	48
Middle MCP	59	91
Middle PIP	82	99
Middle DIP	24	52
Ring MCP	74	WNL
Ring PIP	78	102
Ring DIP	35	55
Small MCP	89	WNL
Small PIP	90	93
Small DIP	35	54
Thumb MCP	40	63
Thumb IP	0	65

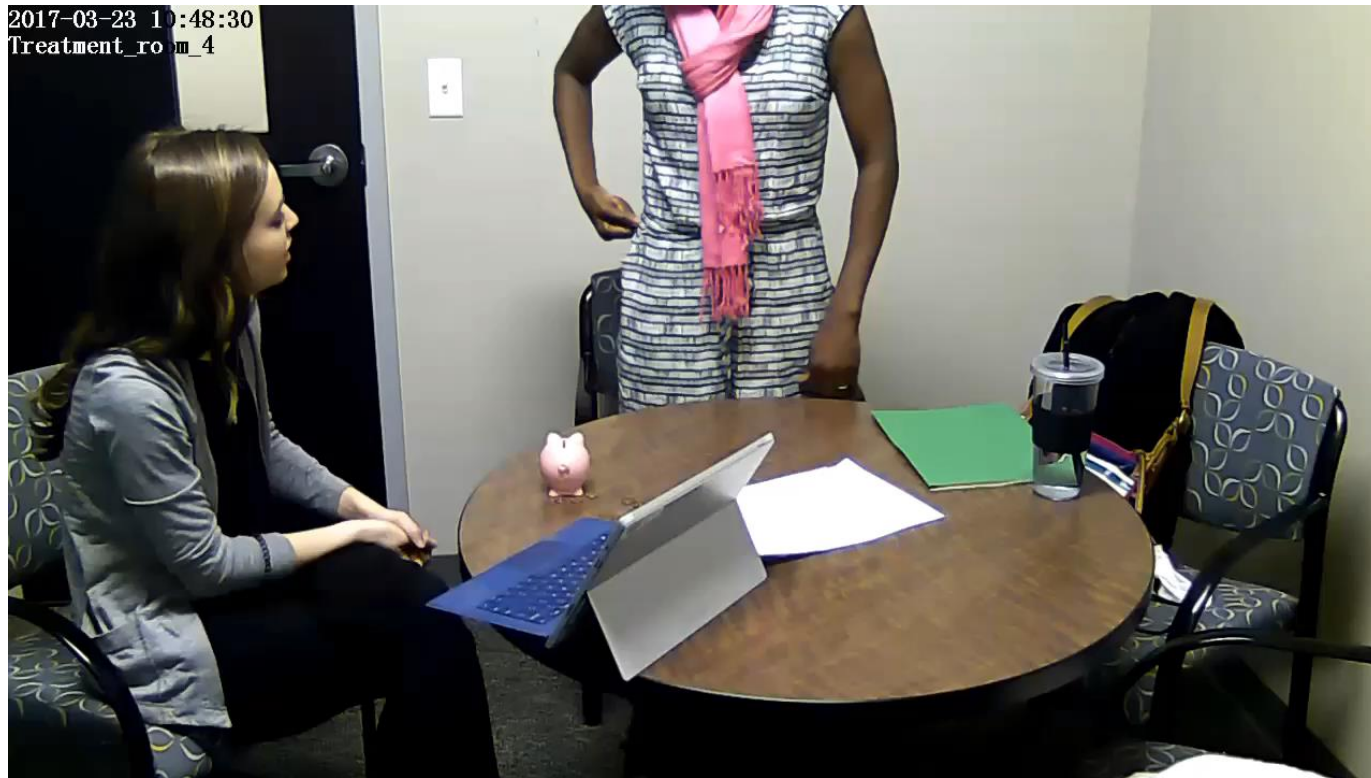
## EDA'S FUNCTIONAL OUTCOMES

- 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

# MONEY MANIPULATION & BUTTON FASTENING



2017-03-23 19:48:30  
Treatment\_room\_4





## 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 & Ruth (Char's Mom)



# CHAR'S ASSESSMENT

<b>Initial Eval (4/3/17):</b>	<b>Progress Note (7/5/17):</b>
Occupational Profile  Goniometrics of Shoulder, Elbow, Forearm and Wrist  Dynamometry  Fugl Meyer  Motor Activity Log	Box and Blocks  Pinch Gauge

## 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

## CHAR'S OUTCOMES – ACTIVE RANGE OF MOTION

	<b>Initial Eval (4/3/17)</b>	<b>Progress Note (8/14/17)</b>
Shoulder Flexion	WNL	WNL
Shoulder Extension	32	40
Shoulder Abduction	64	WNL
Shoulder IR	WNL	WNL
Shoulder ER	55	74
Elbow Flexion	132	WNL
Elbow Extension	-41	WNL
Wrist Pronation	WNL	WNL
Wrist Supination	30	WNL
Wrist Flexion	24	52
Wrist Extension	36	54
Wrist Ulnar Deviation	4	WNL
Wrist Radial Deviation	9	WNL

## CHAR'S OUTCOMES – FUGL MEYER, GRIP & PINCH STRENGTH

	<b>Initial Eval (4/3/17)</b>	<b>Progress Note (8/14/17)</b>
Fugl Meyer	41/64	54/64
Right Grip Strength	12#	26#
Pinch Gauge - Lateral	NA	8.8#
Pinch Gauge – 3 Point	NA	4.4#
(Modified) Box & Blocks Test	NA	8 blocks

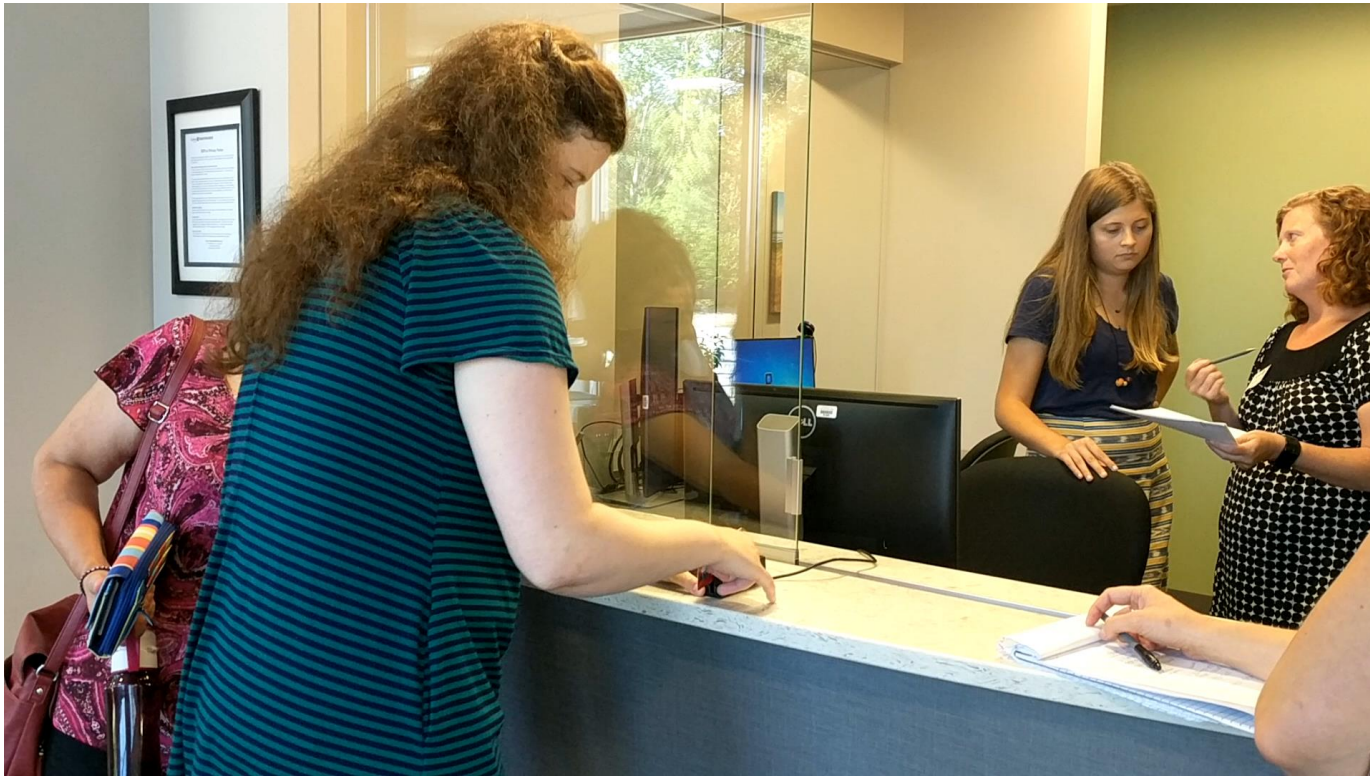
# CHAR'S FUNCTIONAL TASKS

- 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

## REFERENCES

- Könönen, M., Tarkka, I. M., Niskanen, E., Pihlajamäki, M., Mervaala, E., Pitkänen, K., & Vanninen, R. (2011). Functional MRI and motor behavioral changes obtained with constraint-induced movement therapy in chronic stroke. *European Journal of Neurology*, 19(4), 578-586. doi:10.1111/j.1468-1331.2011.03572.x
- Page, S. J., & Levine, P. (2007). Modified Constraint-Induced Therapy in Patients With Chronic Stroke Exhibiting Minimal Movement Ability in the Affected Arm. *Physical Therapy*, 87(7), 872-878. doi:10.2522/ptj.20060202
- Rutuja, M., Asmita, K., & Sujata, Y. (2013). Effect of modified constraint induced movement therapy on upper extremity performance in chronic stroke patients. *Indian Journal of Physiotherapy & Occupational Therapy*, 7(4), p.12-16

## REFERENCES

- Takebayashi, T., Amano, S., Hanada, K., Umeji, A., Takahashi, K., Marumoto, K., . . . Domen, K. (2015). A one-year follow-up after modified constraint-induced movement therapy for chronic stroke patients with paretic arm: a prospective case series study. *Topics in Stroke Rehabilitation*, 22(1), 18-25. doi:10.1179/1074935714z.0000000028
- Taub, E., Uswatte, G., Bowman, M. H., Mark, V.W., Delgado, A., Bryson, C., . . . Bishop-Mckay, S. (2013). Constraint-Induced Movement Therapy Combined With Conventional Neurorehabilitation Techniques in Chronic Stroke Patients With Plegic Hands: A Case Series. *Archives of Physical Medicine and Rehabilitation*, 94(1), 86-94. doi:10.1016/j.apmr.2012.07.029