

# Stroke and Upper Limb Recovery

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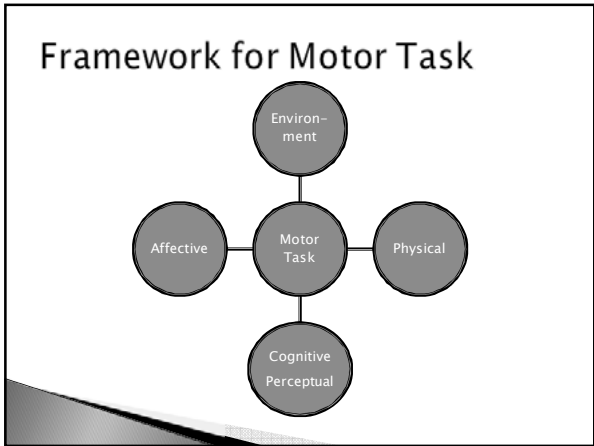
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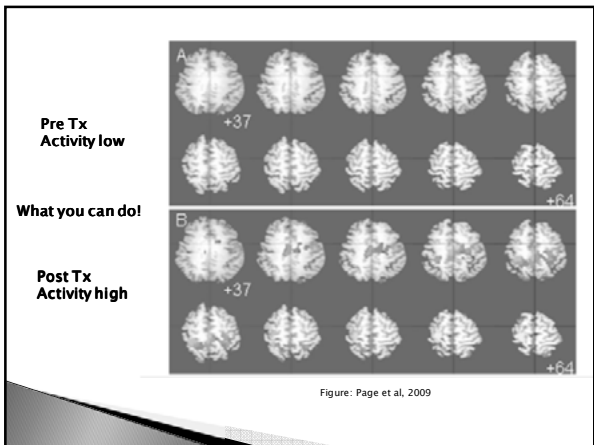
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## The role of Neural Plasticity in Rehabilitation

- ▶ Lesion hemisphere low activation with movement
- ▶ Typical = both hemisphere
- ▶ Rehab Goal = activate lesion hemisphere to produce neural plastic change = improve ADL

Key is Intense task specific activities

### CHALLENGE THEM

Richards et al 2008, Meta-analysis

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## Upper limb recovery

- ▶ Up to 70% have acute deficit
- ▶ 40% retain deficits
- ▶ Vital period for recovery is 3-11 weeks post stroke
  
- ▶ Can see improvement in chronic

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## Major Determinants of Upper Limb Function

- ▶ Motor recovery e.g. voluntary grip, sh. Abduction > 30, sh. elevation
- ▶ Weakness
- ▶ Altered tone
- ▶ Altered sensation
- ▶ Apraxia

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## The Upper Limb

- ▶ Engagement in meaningful activity
- ▶ Need for unilateral and bilateral movement
- ▶ Complex coordination
- ▶ Connection with environment

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## Upper limb function

- ▶ Requires more motor control for functional use
- ▶ Reach, grasp, release, transport, manipulation
- ▶ Initial view of the object strongly influences the movement
- ▶ Inhibiting movement is an essential part of completing a task accurately

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## Lesions to Motor Cortices: Upper motor neuron dysfunction

Primary Motor	Supplementary Motor	Premotor Motor
Contralateral (paresis)	Lack of movement, loss of facial expression	Slow and clumsy movement
Spasticity develops over time	Difficulty with tasks that require use of both hands	Ability to perform sequential tasks deteriorate
Postural reactions reduced, recover, become hyper-active	Problems with self-initiated tasks	Rhythmic movements e.g tapping, typing are disrupted
Most drastically affected: finger movements		Perseveration may occur

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### Parameters of Movement for upper limb

- › Object
- › Speed
- › Accuracy
- › Degrees of freedom
- › Force
- › Sequencing
- › Planning
- › Environment
- › Experience

TASK ANALYSIS

What are you asking them to do

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### Assessment of Upper Limb

Keep in mind what you ask your client to do and how you set up the environment  
 How does changing movement parameters impact ability to complete task

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### Analyze the Movement

- › Automatic movement (client)
- › How do they move during facilitation of movement (you)
- › Selective movement or mass
- › Stability for mobility (from Bobath)
- › Smooth or effortful
- › Compensation?
- › Balance
- › Transitions - very important
- › Phases of movement

Principles of Bobath

Impact of movement on function

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Goal is to optimize movement not perfect it.

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Treatment of upper limb post stroke

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**Principles to keep in Mind**

- ▶ Activity/exercise should approximate the required task (specificity)
- ▶ The way we move is influenced by context i.e. shape, weight, distance of object.
- ▶ **INTENSITY:** volume (repetitions)  
                  ↑  
                  exposure (time in therapy)  
                  performance level

Number of repetitions needed? (Lang et al, 2009)

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7 sites (6 US sites, plus GF Strong Rehab Centre in Vancouver)

41 upper extremity functional repetitions/OT session

12 upper extremity functional repetitions/PT session

Lang et al. 2009

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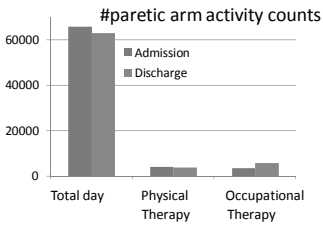
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### Arm activity is low in stroke rehab

Number of steps during inpatient rehabilitation is low



Age-matched controls have 180,000 counts (3 times as much)

*Disparity between functional recovery and daily use of the upper and lower extremities during subacute stroke rehabilitation. Rand D, Eng JJ. Neurorehab Neural Repair 2011.*

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### Inactive and Alone

(Bernhardt et al 2004, 2007, 2008; Ada et al 1999; English et al 2007)

- › Spend over 60% in bed
- › 6% in therapeutic activity
- › 11 minutes of upper limb/session

- › 34% of therapy was task-specific activities
- › Focus is on impairment



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### Principles to keep in Mind

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- › The way we move is influenced by context i.e. shape, weight, distance of object.

- › INTENSITY: volume (repetitions)  
                   ↑ exposure (time in therapy)  
                   performance level

Number of repetitions needed? (Lang et al, 2009)

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- › Ideas on how to move from this type of task to one that might have meaning or be activity focused????




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### Ideas

- › Styrofoam balls into holes cut in boxes - make more challenging by size of hole, size of ball
- › Bean bag/ball toss - more challenging by distance to throw, size of target, weight of object throwing
- › Games - dominoes, checkers, marbles
- › Mount things on the wall - extra challenge
- › Art: make something
- › Seasonal activities outside
- › Ball toss throw hula hoops - you hold them at different distance and heights
- › Using things they like in the activity e.g. favorite drink, food, golf club etc
- › OT/PT joint sessions

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**An example of graded intensity of UE practice**

- Functional exercises for grip (10 min), hand manipulation (10 min), finger control (10 min)
  - RPE: somewhat hard to hard, clock stops when resting!
- Intensity increased by manipulating support by therapist, speed, accuracy, object characteristics (weight, shape, size, friction), #reps, amplitude, predictability

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**GROUPS**

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- Side by side – with a partner or therapist
- Means to increase time in treatment



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### Try a New Modality



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### Role of Family



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