

10 things I wish I'd known as a new graduate about stroke and upper limb retraining

Presented by

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Aims

- Highlight changes in research and knowledge
- Propose a curricula for teaching upper limb analysis and training

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Take-Home Messages: I wish I had learned earlier to...

- **Be a movement scientist**
 - Know your anatomy & understand biomechanics
 - Use video technology for task analysis and feedback
- **Focus on negative impairments** (ie weakness) not spasticity
- **Coach well to motivate learners**
 - Goals, instructions & feedback; enable active participation: Hands off
- **Offer (and teach) evidence-based /informed therapies**
 - Clinical guidelines, systematic reviews, RCTs, biases in research
 - Listen to the preferences, goals and priorities of stroke survivors
 - Show leadership; be prepared to change; offer /teach effective therapies & discontinue ineffective outdated therapies

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Movement Science

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Movement Science

- The study of movement
- Factors influencing movement
- Understanding of how people learn motor tasks and acquire skills
- Neuroplasticity
- Task-specific training

Carr, Shepherd, Gordon, Gentile & Held (1987). Movement science: Foundations for physical therapy in rehabilitation. Heinemann

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Applied Anatomy

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Shoulder Flexors

Pectoralis major (clavicular head)
Biceps brachii (long head) & coracobrachialis
Anterior deltoid

Acknowledgement: bodybuilding-wizard.com

Importance of muscles that transport the hand during reaching

- **Shoulder flexors:** Anterior deltoid, pectoralis major/minor, biceps brachii, coracobrachialis
- **External rotators:** Supraspinatus, infraspinatus, teres minor, posterior deltoid

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External Rotators

Supraspinatus
Infraspinatus
Teres Minor
Posterior Deltoid

Acknowledgement: bodybuilding-wizard.com

Reaching for a Glass

Transport:

- Shoulder forward flexion
- External rotation

Importance of thumb abductors & interossei for pre-shaping the hand during reaching

- **Thumb abductors:**
 - Abductor pollicis
 - Abductor pollicis brevis
- **Interossei:** Palmar & dorsal

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Importance of thumb abductors for pre-shaping the hand during reach

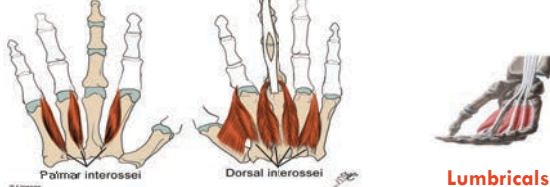
- **Thumb abductors:**
 - Abductor pollicis
 - Abductor pollicis brevis

Acknowledgement: breakingmuscle.com

Importance of **interossei** for **pre-shaping**

Dorsal Interossei: ABDuct the fingers

Palmar interossei: ADDuct the fingers and help the lumbricals flex MCP joints and extend IP joints



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Applied Biomechanics

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Applied Biomechanics

- **Definition:** The study of forces, and the effects of those forces on, and within, the body
 - **Kinematics:** What we see: Joint displacements/changes, trajectory, time, acceleration/deceleration
 - **Kinetics:** Forces that cause movement: Torque, gravity, friction
- **OT/OP models** refer to 'biomechanical' & 'physical' but....
 - Little or no reference to the science of kinematics and kinetics
 - Refer to range of movement, strength, coordination, grasp, 'tone'

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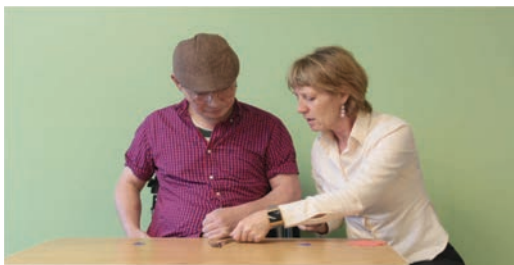
Be a movement scientist

- **Hypothesise** about the **causes** of observed movement differences
- **Observe/ assess** muscle activity during reach/manipulation:
 - Which muscles should be active (eg anterior deltoid) ?
 - Are those muscles contractingor not ?
 - What looks different ?
- **Hypothesise** at the level of clinical intervention
 - Weak anterior deltoid => task-specific strength training + e-stim

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Stroke survivor asked to pick up a fork



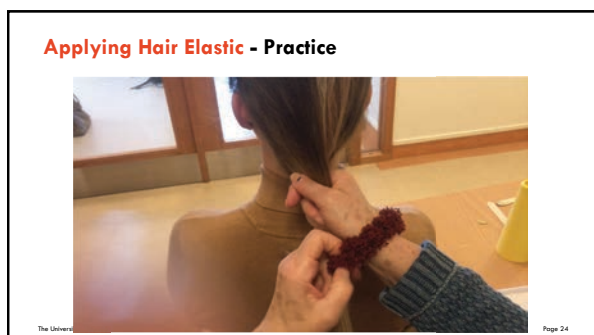
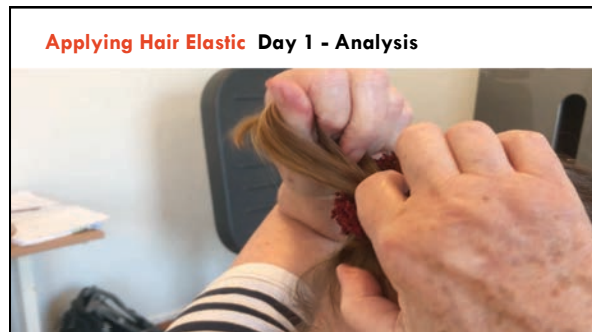
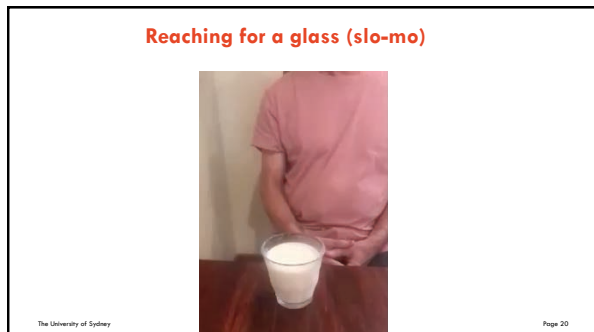
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Use video technology for task analysis and feedback



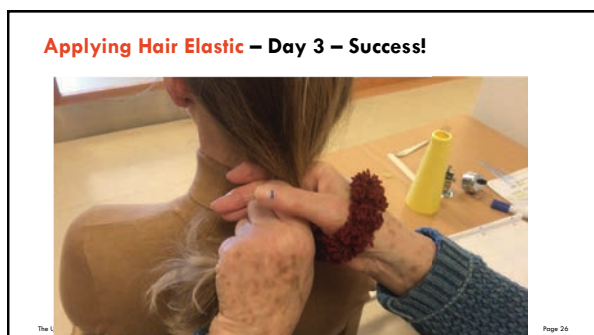
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Exercise to improve control of hair elastic

- **Purpose:** To improve coordination and strength of:
 - Thumb abduction & IP extension
 - Finger IP/MCP extension
 - Finger abduction
- **Instructions:** Place the elastic around thumb/fingers – hold the elastic at nail level – place elastic over jar



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Positive v Negative Impairments (Ada & Canning 2005)

- **Positive impairments:** Additions to body functions
 - Abnormal reflexes, postures
 - Spasticity
- **Negative impairments:** Loss of body functions
 - Paralysis or inability to contract muscles
 - Loss of muscle strength, coordination, sensation

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Analysis: Using a fork



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Coach well to motivate learners: Goals, Instructions & Feedback

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UL goals for 2-week CIMT program

COPM
Canadian Occupational
Performance Measure

Steve

- Taxi driver, poker player, basketball coach
- ~ 4 yrs post-stroke
- Lives in rural area



OP Problem	Importance	Performance T1	Satisfaction T1
Dribbling basketball	5	2	3
Tapping to music	5	3	1
Dealing cards	5	5	1
Shooting 3 pointers	3	1	1
Play a season of basketball	6	1	1
Total Scores	24	12	7
Average Scores	4.8	2.4	1.4

Acknowledgement: Louise Massie, Townsville-Mackay Medicare Local

Coach well to motivate learners

Goals:

- Immediate, short-term, longer-term
- Increase effort in sessions with target/goals

Instructions:

- Written & verbal; on video/practice sheets

Feedback:

- Verbal, audio, visual; record on video
- Use video to demonstrate change
- Measure/ re-measure

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Enable Active Participation & Practice

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Manipulating a fork


Day 1
After 30 mins of practice:
2 reps in **7 secs**



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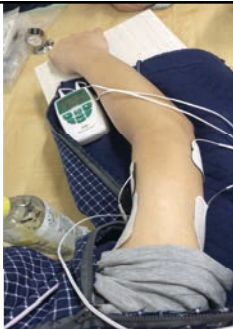
Manipulating a fork

Day 2
After overnight practice:
2 reps in **4 secs**



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Assisted Elbow Flexion/ Extension with Electrical Stimulation



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Repetitions during a 10-day CIMT program
(Acknowledgement: Lauren Christie, CIMT workshop)

CIMT program component	Quantity of practice
Shaping tasks	9,639 reps
Functional activities	84 reps
Time completing functional activities (where repetitions are difficult to quantify e.g. eating a meal)	353 mins
Homework	3,949 reps
Homework time recorded (where repetitions are difficult to quantify)	425 mins
TOTAL =	13, 672 reps + 13 hours extra practice

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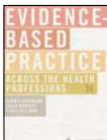
**Evidence-based practice:
Be prepared to change**

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EBP Skills & Knowledge

- Search & critical appraisal
- Understand biases in research
- Systematic reviews and RCTs
- Clinical guidelines

Hoffmann, Bennett & Del Mar (2017)



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Evidence-based practice: Listen to stroke survivors

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EBP: Listen to stroke survivors

- Benefits of qualitative research
- Their experiences, goals and priorities
- Values and preferences of clients/patients
 - Key part of EBP process

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Evidence-based practice: Show leadership

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Show leadership

- Be brave
- Leadership in EBP from:
 - Clinicians, managers and educators
- Be prepared to:
 - Offer/teach effective therapies
 - Discontinue ineffective outdated therapies



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