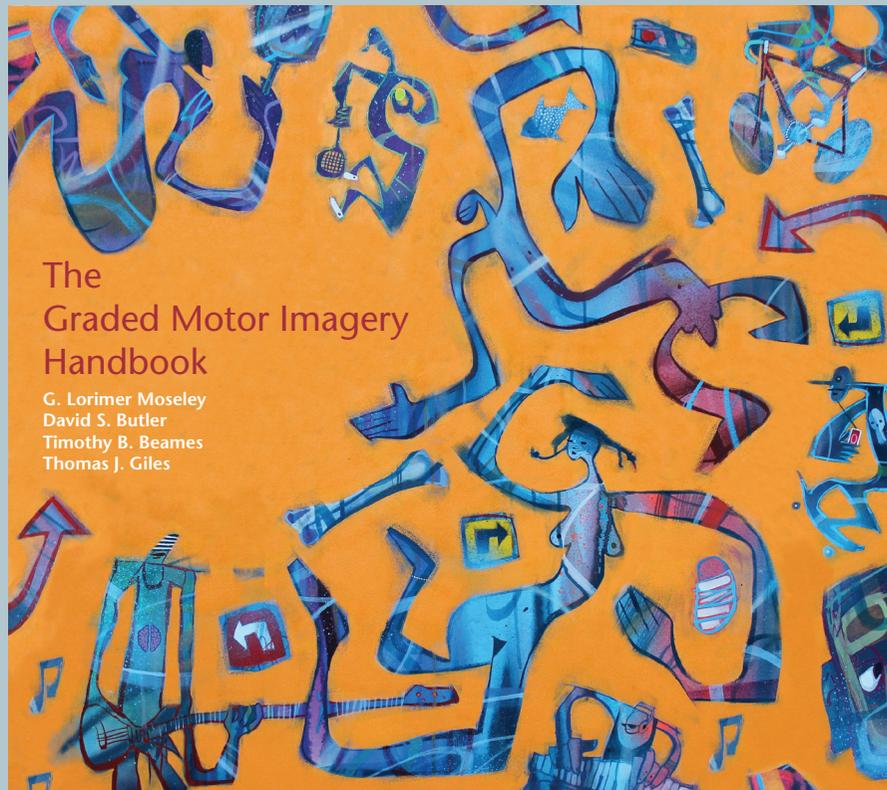


Graded Motor Imagery

GMI is an individually tailored treatment process which has successfully been used for persistent and complex pain states^{1,2,3,4}. It aims to give flexibility and creativity back to the brain via graded exposure.



The Graded Motor Imagery Handbook,
Moseley GL, Butler DS, Beames TB, Giles TJ.
Noigroup Publications, Adelaide, Australia, 2012

References

- 1/ Graded motor imagery is effective for long-standing complex regional pain syndrome: a randomised controlled trial., Moseley, G.L., Pain 2004
- 2/ Is successful rehabilitation of complex regional pain syndrome due to sustained attention to the affected limb? A randomised clinical trial. Moseley, G.L., Pain 2005
- 3/ Graded motor imagery for pathologic pain: A randomized controlled trial. Moseley, G.L., Neurology 2006
- 4/ Does evidence support physiotherapy management of adult Complex Regional Pain Syndrome Type One? A systematic review. Daly, A. E., Biolocerkowski, A. E., European Journal of Pain, 2008.

“CONCLUSIONS: Graded motor imagery should be used to reduce pain in adult CRPS-1 patients. Further, the results of this review should be used to update the CRPS-1 clinical guidelines.”

Implicit Motor Imagery (left/right judgements)

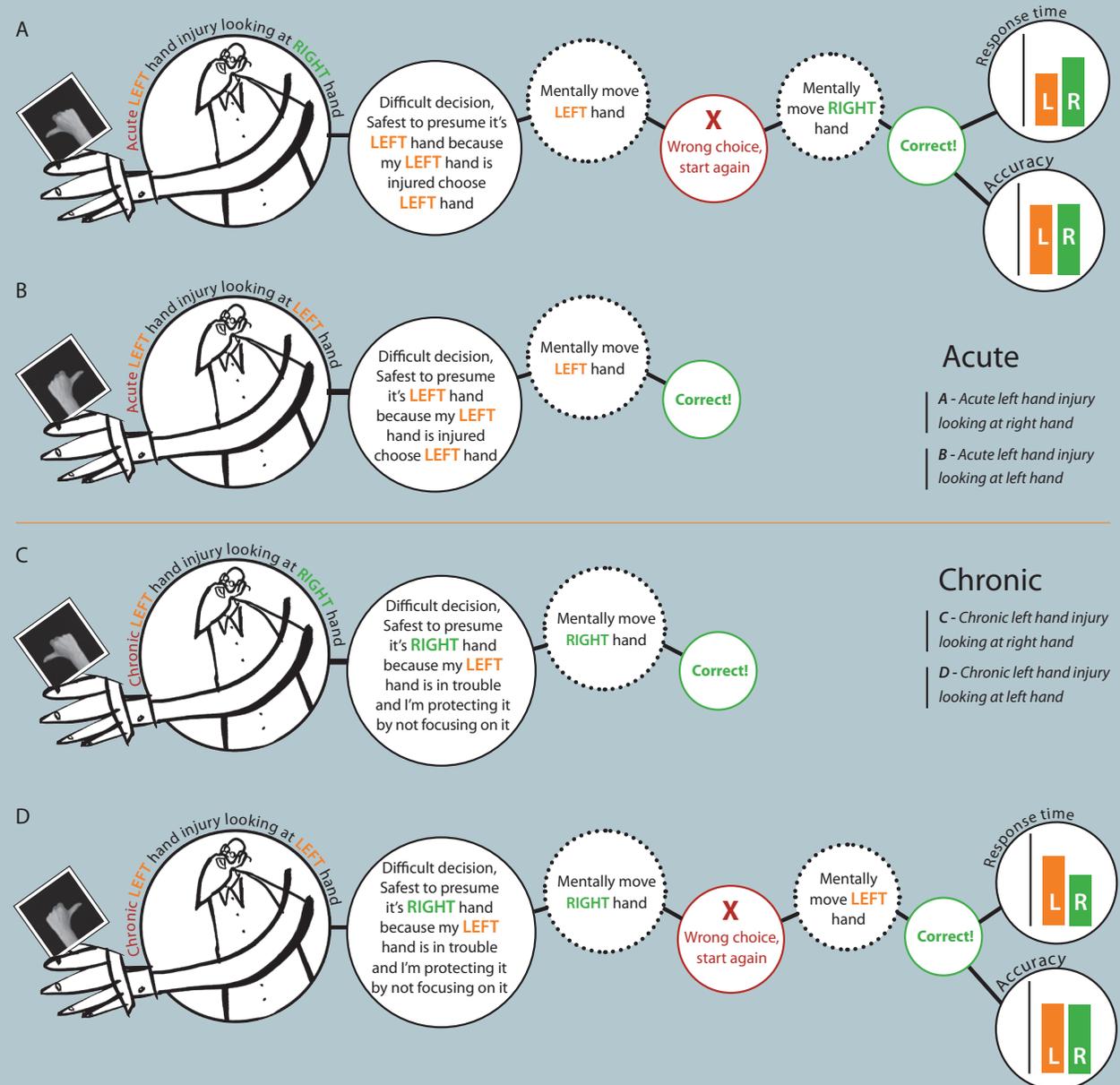
- You don't know you are mentally moving
- Premotor cells modify primary motor cells without activating them
- Less likely to activate the pain neurotag

What is 'normal'? Broad guidelines are:

- Aim for accuracy of 80% and above
- Similar results for left and right (no bias)
- Aim for response time (speed) of 1.6 seconds +/- 0.5 seconds for necks and backs
- Aim for response time (speed) of 2 seconds +/- 0.5 seconds for hands and feet
- Consistent over a period of at least a week

References

- Parsons LM., *Integrating cognitive psychology, neurology and neuroimaging*. Acta Psychologica 2001;107:155-81.
- Schwobel J, Coslett HB, Bradt J, et al. *Pain and the body schema: effects of pain severity on mental representations of movement*. Neurology 2002;59:775-7.
- Wallwork S, Butler DS, Darmawan I, et al., *Motor Imagery of the neck. Age, gender, handedness and image rotation affect performance on a left/right neck rotation judgement task*. Submitted 2012.
- Bowering J, Butler DS, Fulton I, et al., *Implicit motor imagery in people with a history of back pain, current back pain, both or neither*. Submitted 2012.



Acute

- A - Acute left hand injury looking at right hand
- B - Acute left hand injury looking at left hand

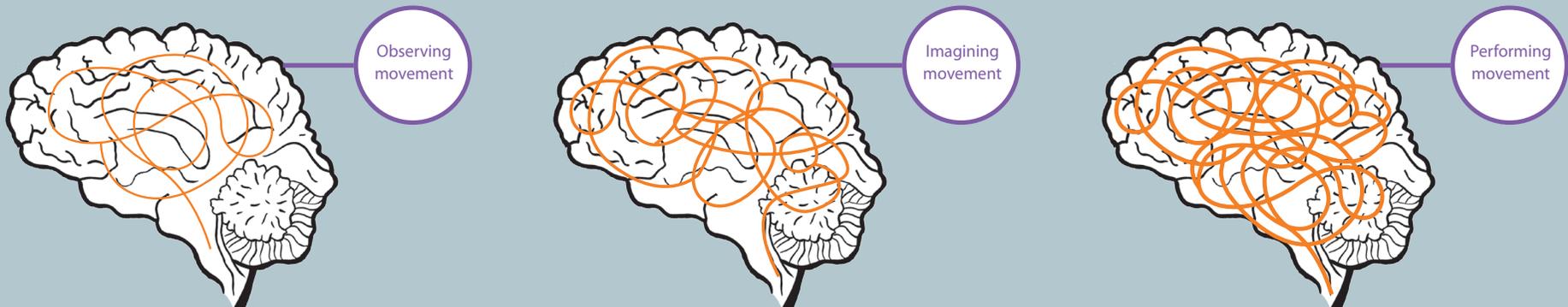
Chronic

- C - Chronic left hand injury looking at right hand
- D - Chronic left hand injury looking at left hand

Explicit Motor Imagery

Thinking about moving without actually moving – *imagined* movements.

There are many different ways to go through the process and the most common method used in GMI is a first person perspective of feeling your own movement and postures. Graded activation of the brain through observation, imagining movements and actual movements.



Ideas board

- Where do I practice explicit motor imagery?
At home, work, school, on the bus, in the bath?
- Do I keep my eyes open or closed during motor imagery?
- What position do I adopt during imagery?
Sitting, standing, lying?
- Do I think of myself moving (first person) or someone else moving (third person)?
- How long should I perform imagery for and how many times a day?
- What is the task complexity and intensity and how does it tie in with grading my exposure?
- What words should the therapist use to describe or talk through the process?
- What words should the user think of when going through the process?
- What cues can be used to heighten the process? Sounds, memories, smells?
- Should there be prior demonstration of the movement by another person (therapist, family member)?
- Do I use relaxation or meditation in conjunction?
- How much do I know about the changes in the brain that I can achieve with imagery?

References

Ehrson HH., et al., *Imagery of voluntary movement of fingers, toes, and tongue activates corresponding body-part-specific motor representations.* J Neurophysiol. 2003 Nov;90(5):3304-16.

Mirror Therapy (1)

Therapist as illusionist

Mirror therapy means looking into a mirror to see the reflection of the limb or body part in front of it. The mirror will effectively give the illusion that you are looking at the limb that is hidden. Brain activation during mirror therapy is less than actual movement but slightly more compared with imagining the same movement.



Using a mirror box

In this situation the problematic limb is hidden in the box. Looking at the mirror image of the left limb gives the illusion of seeing the hidden right limb.

References

Diers M., et al. *Mirrored, imagined and executed movements differentially activate sensorimotor cortex in amputees with and without phantom limb pain.* Pain 2010

Mirror Therapy (2)

Tips and examples of progression for using a mirror box

More sensitive

INSIDE THE BOX

- Keep the hand still/resting in a comfortable position
- Keep the hand still/resting
- Keep the hand still/resting
- Keep the hand resting with a slight bend in the fingers
- Bend the wrist up and down within the limit of pain
- Oppose the fingers and gently touch together
- Make a fist, pushing into some discomfort. Then repeat in time with the hand outside the box
- Rotate the hand and wrist fully
- Move both hands fully and include some extra tasks, e.g., squeezing a ball or writing
- Include tools that are more threatening such as a knife

OUTSIDE THE BOX

- Keep the hand still/resting in the same position as the hand in the box – just observe the reflection
- Rotate the hand
- Oppose each finger separately
- Make a fist then slowly relax; repeat
- Bend the wrist up and down through its full range of movement
- Oppose the fingers and press with some force together
- Make a fist and squeeze in repetitions
- Copy the hand in the box through a full range of movement
- Copy the hand in the box
- Copy the hand in the box

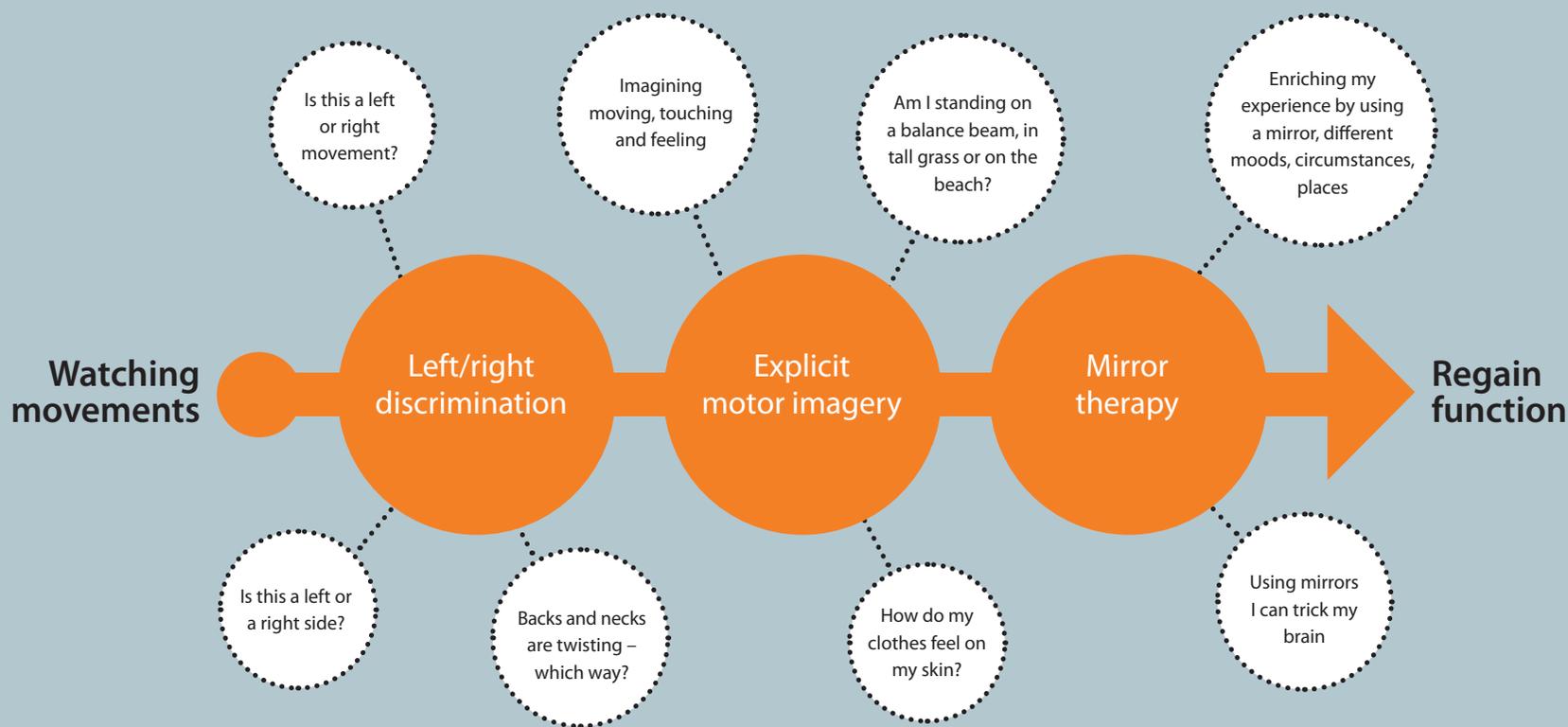
Less sensitive

GMI: a graded approach (1)

A graded approach for treating pain

It appears necessary that GMI is offered in a sequential manner. A strong grounding in the science underpinning GMI is essential for all users to be able to decide best when to move forwards, sideways or backwards through the treatment process.

The ideal sequential progression of the different elements of graded motor imagery:



GMI: a graded approach (2)

A case study

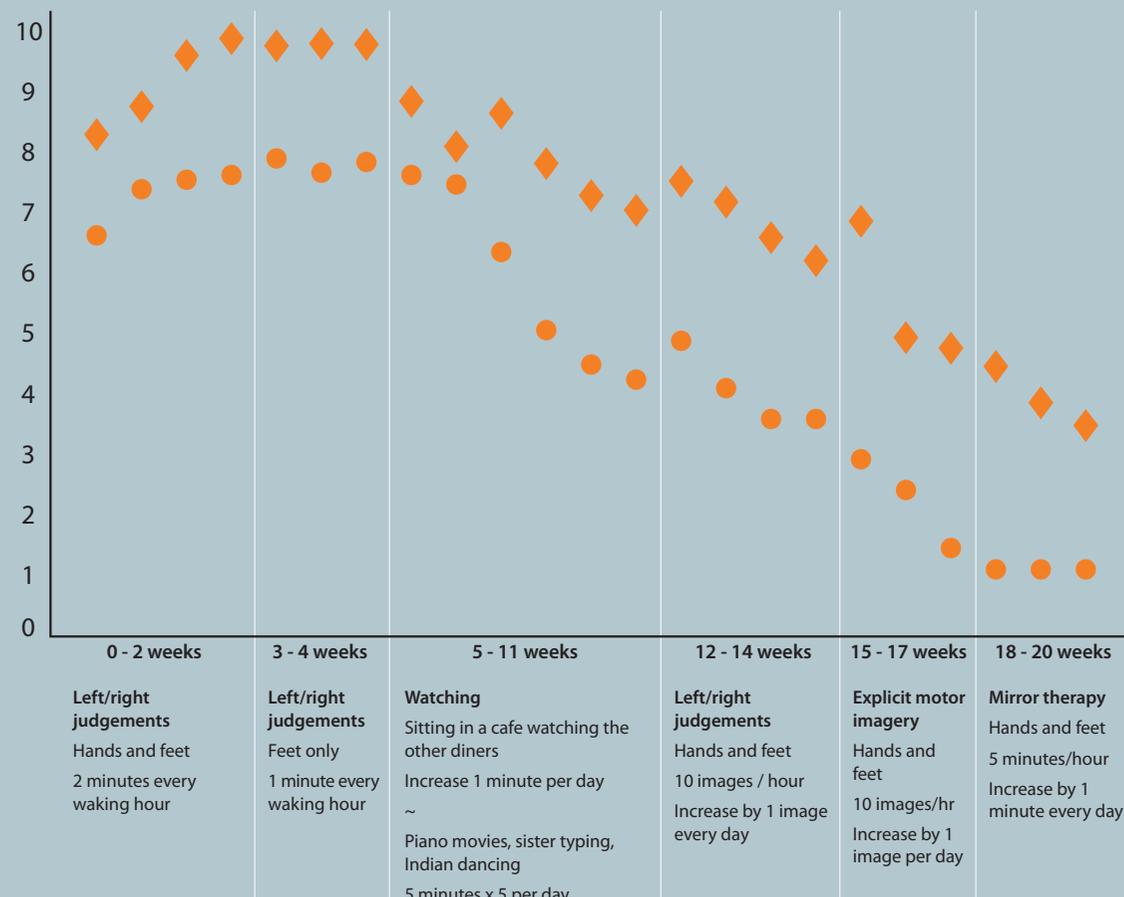
Lucy Loo presented with marked CRPS affecting her arm, leg and face. We treated her with GMI for two minutes every waking hour for the first two weeks. Her pain worsened. You can see this by the slightly upward trajectory of the diamonds, which reflect pain on movement of her thumb, and the circles, which reflect pain at rest.

We then reduced her training and worked on GMI of the feet instead. Two weeks later – no worse but really no better. We then did some motor empathy – we asked her to watch movies of people playing on the piano, watching her sister’s hands as she typed at the computer, and to watch other movements. She clearly began to improve.

We progressed that, spending more time and watching more functional activities, for seven weeks. Then we tried GMI again and this time she responded.

It took another nine weeks to get through the GMI programme, but at 20 weeks after the initial appointment, Lucy started functional exposure. Six months later she had only a small amount of pain when she worked with her hands for half an hour or so.

The trick with her? We had to get under the radar by abandoning GMI and starting instead with motor and functional empathy.



- ◆ Pain on movement
- Resting pain