

Pre Congress Workshop 9 | Wednesday 16 May 2012

Stroke Rehabilitation: Insights from Neuroscience and Imaging

1.30pm - 5.00pm | Rooms 101 & 102 | Melbourne Convention & Exhibition Centre

This workshop is aimed at therapists, rehabilitation specialists, neuroscientists and rehabilitation scientists. Its objectives are to:

- ▶ Inform and challenge clinicians to adopt restorative approaches to stroke rehabilitation based on current evidence from neuroscience and neuroimaging.
- ▶ Present an active skill based learning perspective on stroke rehabilitation.
- ▶ Evaluate rehabilitation approaches to common functions, such as movement and touch, based on neuroscience evidence.
- ▶ Discuss future directions for stroke rehabilitation clinical practice and research.

PRESENTERS *Professor Leeanne Carey and Dr Donald Tournier Florey Neuroscience Institutes, VIC, Australia*

Professor Michael Nilsson Hunter Medical Research Institute, NSW, Australia

Dr Cathy Stinear University of Auckland, New Zealand

PROGRAM

1.30pm*	Leeanne Carey	Introduction and welcome Stroke Rehabilitation: A Learning Perspective
2.00pm*	Michael Nilsson	Neural plasticity as a basis for stroke rehabilitation
2.30pm*	Donald Tournier	Imaging techniques provide new insights
3.00pm	AFTERNOON TEA	
3.30pm*	Cathy Stinear	Rehabilitation of common functions: Movement
4.00pm*	Leeanne Carey	Rehabilitation of common functions: Touch and body sensations
4.30pm - 5.00pm**	Leeanne Carey Michael Nilsson Cathy Stinear Donald Tournier	PANEL DISCUSSION: Directions for stroke rehabilitation clinical practice and research

*20-25 minute address + 5-10 minute discussion. **5 min address + open panel discussion

ABSTRACTS

STROKE REHABILITATION: A LEARNING PERSPECTIVE **Leeanne M. Carey, Helene J. Polatajko, Lisa Tabor Connor, Carolyn M. Baum*

In this workshop Prof Carey will introduce the concept of learning as being central to neurorehabilitation & consistent with advances in neuroscience and the emerging knowledge on adaptive neural plastic changes in the brain. A common language for rehabilitation science will be presented that spans from biomedical mechanisms to participation and environment. Theoretical and empirical foundations for learning-based approaches will be discussed based on neuroscience and the literature of skill acquisition.

A learning-based model of rehabilitation will be presented that identifies the gap between brain function and function in everyday life and the learning strategies that may be used to bridge that gap. Learning-based rehabilitation impacts outcomes that span changes in brain systems to performance and participation. Examples of learning based approaches to rehabilitation will be outlined and the importance of measuring response to rehabilitation across all levels will be highlighted.

ABSTRACTS *continued***NEURAL PLASTICITY AS A BASIS FOR STROKE REHABILITATION****Michael Nilsson, Milos Pekny, Marcela Pekna*

In this session Prof Nilsson will describe the main structural and functional constituents of neural plasticity that are believed to contribute to recovery of function after stroke. Current understanding of the mechanisms underlying neural plastic changes after stroke stems from experimental models as well as clinical studies and provides the foundation for evidence-based neuro rehabilitation. Selected behavioural manipulations and adjuvant therapies that can stimulate neural plasticity and improve recovery of function, in particular when applied in combination with task-specific physical therapy and in a stimulating environment, will also be discussed. Personalized neurorehabilitation approach addressing each patient's specific needs and provided by a specialized multidisciplinary team is best suited to achieve the optimal outcome in functional recovery after stroke.

IMAGING TECHNIQUES PROVIDE NEW INSIGHTS**J. Donald Tournier, Richard Masterton, Rüdiger J. Seitz*

Dr Tournier will introduce the audience to some neuroimaging tools and techniques that may be used to investigate recovery after stroke. The session will focus on the technical aspects of the methods introduced, with a view to providing a good understanding of the methods, their potential and their limitations. Featuring in particular are advanced MRI techniques to study brain function (using functional MRI) and to investigate white matter connectivity (using diffusion-weighted MRI and tractography). Suggestions of how these techniques may be used in stroke rehabilitation will be provided.

REHABILITATION OF COMMON FUNCTIONS: MOVEMENT**Cathy Stinear, Isobel Hubbard*

The rehabilitation of impaired motor function after stroke plays an essential role in helping patients to recover independence and quality of life. There are a number of new approaches and adjunct techniques being investigated, such as repetitive task-specific training, constraint-induced movement therapy, mental practice, robot-assisted training, electrostimulation and EMG biofeedback, virtual reality and visuomotor tracking training. Dr Stinear will provide an overview of their behavioural effects and the available evidence of their neural mechanisms. In general, studies of neural plasticity in response to motor rehabilitation are biased towards the upper limb and chronic patient cohorts, and limited by small

sample sizes. Despite this, the emerging picture is that techniques employing the principles of motor learning, such as repetition, progression and variation, promote facilitation of ipsilesional cortical activity and improved paretic limb control. While there is a great deal more research required in this area, these early findings are promising.

REHABILITATION OF COMMON FUNCTIONS: TOUCH AND BODY SENSATIONS*Leeanne Carey*

One in two people experience loss of body sensations after stroke. In this workshop Prof Carey will outline the nature and impact of the deficit and review a model for the central processing of somatosensory information. Key features of central processing are identified in relation to their potential impact on recovery. Neural correlates of sensory recovery after stroke are reviewed. Three key treatment principles that arise from neuroscience are discussed. These are: goal directed attention and deliberate anticipation; calibration across modality and within modality; and graded progression within and across sensory attributes and task. Examples of how these principles have been operationalised into training strategies will be provided. Current approaches to sensory rehabilitation are critically evaluated in the context of neuroscience. The steps involved in moving toward a neuroscience-based model of sensory rehabilitation will be suggested.

Panel Discussion: DIRECTIONS FOR STROKE REHABILITATION CLINICAL PRACTICE AND RESEARCH*Leeanne Carey, Michael Nilsson, Cathy Stinear, Donald Tournier*

A paradigm shift is occurring in the way we think about stroke recovery and rehabilitation. The rapid growth of new knowledge over the last decade has generated at least as many questions as answers, however there are some themes emerging. The aim of this workshop has been to bring the evidence behind these new concepts and paradigms of recovery to practicing clinicians. Three concepts that have relevance for stroke rehabilitation will be briefly presented. These are: (i) looking beyond the lesion to remote effects and impact on brain networks; (ii) the value and application of network based models of recovery of specific functions to guide neuroscience-based rehabilitation; and (iii) tailoring interventions to the individual, based on viable brain networks with capacity for plasticity. Future directions for stroke rehabilitation research will be discussed in the context of the ideas presented in the workshop.