

Stroke Research



Dr Penelope McNulty



At Neuroscience Research Australia, our vision is to prevent and cure diseases and disabilities of the brain and nervous system through leadership, excellence and innovation in neuroscience research.

In order to meet the new and often unexpected challenges inherent in medical science, and to increase our overall effectiveness, we are constantly evolving. But one thing that remains unchanged is our dedication to supporting first-class science as we work to transform the results of basic research into practical benefits for patients.

WHAT WE KNOW ABOUT STROKE Stroke is the second largest cause of disability in Australia. More than 60,000 Australians suffer a stroke every year and this number will only increase with the ageing population and the growing epidemics of obesity, diabetes and physical inactivity. While new treatments save lives, more patients survive with disabilities, but more than half of these will be profoundly limited in activities of daily living. There is no cure for stroke, nor any forthcoming. The only method to recover functional movement is through rehabilitation. Our understanding of changes in the brain has grown enormously in the last few years. However, much less is known about how the brain controls muscles and the forces they produce after stroke, or even how rehabilitation works to improve movement ability.

ABOUT OUR RESEARCH We are working to understand how a stroke alters the body's capacity to produce functional movements and how this changes with recovery and rehabilitation. Our work focuses on the upper limb, because for reasons which we do not fully understand, the upper limb is more impaired after stroke than the lower limb. Good upper limb function is essential for independently undertaking activities of daily living. While much research focuses on what patients can do after their stroke, we are interested in understanding why, where and how: why is movement restricted? where are the key mechanisms in the body that cause impaired movement? and how can we make rehabilitation work better for all stroke patients?

WHAT WE HAVE DISCOVERED We know that stroke patients have weaker muscles and less sensation on the affected side compared to healthy people of the same age and gender. Studies in our laboratory have shown that stroke patients cannot sustain stable low-level muscle contractions that are typically used for everyday activities like holding shopping, cutlery or a telephone, or to carry a plate from the kitchen to the table. The control of muscle force is worse if patients cannot see what they are doing or, if they are distracted during the task.

Rehabilitation is like taking medicine, we know it is good - we just don't like doing it. One of the biggest impediments to successful rehabilitation is patient compliance. Results from our trial of video game rehabilitation show that because patients have fun, they practice for longer than they have to, resulting in significantly improved movement ability. We have also shown that these improvements transfer into activities performed as part of everyday life, increasing the independence of our stroke patients.

If you would like to take part in research into stroke rehabilitation, please call Dr Penelope McNulty on 02 9399 1074 or email p.mculty@neura.edu.au. Or, for further information on supporting research at Neuroscience Research Australia, please call 02 9399 1122. or email foundation@neura.edu.au.



While we hope you find this brochure useful, it is always important to discuss any questions about stroke, or its treatment, with your doctor or other health care provider.



CURRENT PROJECTS

WE ARE LOOKING AT the way the brain signals a movement to the limb muscles and how this movement is controlled once it has begun. This involves not only the brain's ability to drive a muscle, but what changes might occur as the signal is passed from one nerve cell to another in the spinal cord; as it travels down the peripheral nerve and once it reaches the muscle itself. These tests will provide non-invasive, pain free methods to evaluate changes after stroke and improvements with recovery and rehabilitation that do not rely on expensive imaging techniques.

WE HAVE DEVELOPED a new rehabilitation tool using the Nintendo Wii game system. Our study has shown significant improvements in upper limb function after only two weeks of intensive therapy. Not only did patients improve their ability to use their arm and hand, they enjoyed therapy and found it was no longer a chore. This rehabilitation strategy allows us to design programs to target the specific disabilities of stroke patients at an individual level. We are now implementing a large study to investigate how Wii therapy works and how we can make it work even better.

WE ARE WORKING TO UNDERSTAND the secondary symptoms that develop after 6-12 months and that can be just as debilitating as the original stroke. Our study of reflexes will allow us to investigate how information processing within the spinal cord is altered. These involuntary movements provide a window to understand how the movement and sensory systems are linked to produce finely controlled movements.

IN ORDER TO FULLY UNDERSTAND THE CHANGES after stroke we compare our results to healthy age and gender matched subjects. These control studies are providing invaluable information about how physiology changes with healthy aging. While we know 70 year olds are not the same as 20 year olds, most of our knowledge about physiology has been derived from studies in younger people. Our studies will provide normative data so that the rehabilitation goals we set after stroke are appropriate for the age and sex of our patients.