New research supporting stroke rehabilitation

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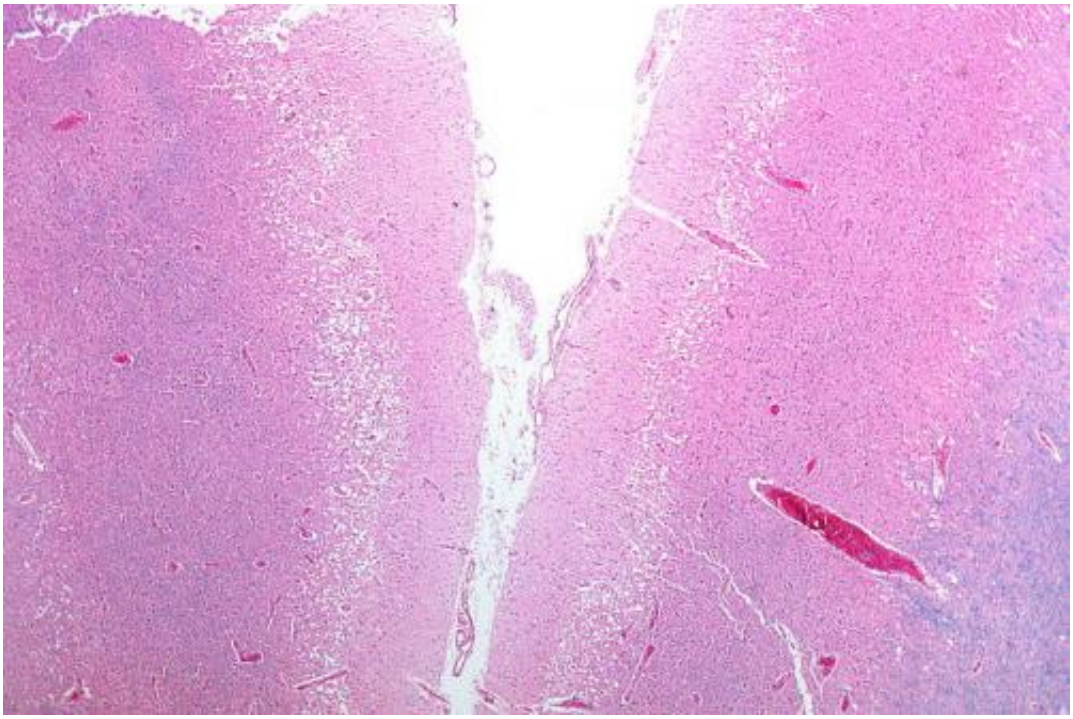

Micrograph showing cortical pseudolaminar necrosis, a finding seen in strokes on medical imaging and at autopsy. H&E-LFB stain. Credit: Nephron/Wikipedia

Using world-leading research methods, the team of Dr David Wright and Prof Paul Holmes, working with Dr Jacqueline Williams from the Victoria University in Melbourne, studied activity in an area of the brain responsible for controlling movements when healthy participants observed a video showing simple hand movements and simultaneously

imagined that they were performing the observed movement.

Using transcranial magnetic stimulation - a technique where a coil placed over the scalp delivers a stimulation to the brain, activates neurons in the underlying area, and causes a muscular contraction in the participant's hand - the researchers found that combining imagery (imagining the feelings associated with performing the movement) with observation (watching the movement) created the strongest activity in the brain.

Using electrodes on the participant's hand, the researchers found that muscle contractions in response to the cortical stimulation were larger when participants were concurrently imagining themselves moving their muscle whilst watching a video of a hand moving on screen, compared to when they used the imagery or observation techniques alone. or engaged in various control conditions.

This research, which is published in the open-access journal *Frontiers in Human Neuroscience*, may provide useful applications for the care of stroke patients who have restricted use of their upper limbs. If stroke patients practice the recommended techniques, it could potentially help maintain activity in movement-related brain areas, especially when used alongside more traditional physiotherapy techniques where the same movements are also practiced physically.

Dr Wright said: "The idea is that because imagery and observation techniques share some characteristics with physical movement in terms of activating similar areas of the brain, if someone can't perform the movements themselves physically, it might be possible to keep those areas of the brain active through imagery and observation techniques. This might help contribute to the recovery of motor function."

Currently, imagery and, less frequently, observation are used separately alongside physical therapy during the rehabilitation of stroke patients,

but Prof Holmes suggested that combining the two techniques may support re-learning of movement patterns for some patients.

He said: "After a stroke, parts of the brain die and will not recover. To compensate, other parts of brain can alter their function to take control of the lost behaviour - a form of brain plasticity. We think that combining imagery and observation, in addition to physical therapy, may allow the brain to speed up this plastic change as well as benefitting more psychological aspects of recovery such as movement confidence". He continued, "the research team's work in this area has the potential to make a real impact on the way physiotherapists, occupational therapists and nurses work with the stroke community"

"These changes may happen without the intervention - it is certainly not a miracle cure - but the combined imagery and action observation approach should speed up the process of relearning movements that have been lost."

The research was funded by Manchester Metropolitan University's Knowledge Exchange Innovation Fund and a Research Accelerator Grant awarded to Dr Wright (an early career researcher in the Motor Cognition Research section of the Centre of Health, Exercise and Active Living).

Future research by the Group will seek to establish optimal methods for delivering these psychological interventions for stroke rehabilitation by investigating the effects of different types of instruction given to participants and different video presentation methods on activity in the brain during combined imagery and observation. The team also expect to release a stroke rehabilitation App in early 2015.

More information: Combined action observation and imagery facilitates corticospinal excitability , *Frontiers in Human Neuroscience* ,

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