



Stroke Assembly
Wales

Plenary 3:

Can the brain rewire itself?

Dr Charlotte Stagg

Associate Professor and Sir Henry Dale
Fellow, University of Oxford

#strokeassembly

www.stroke.org.uk/uksa

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Strôc | **Stroke**
association

Can the brain rewire itself?



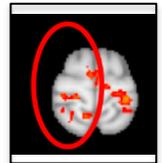
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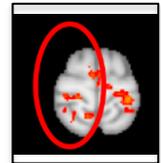
Outline

- How is the structure of the brain relevant to recovery?
- What happens to the brain after a stroke?
- How does natural recovery happen?
- What can we do that might help that recovery?

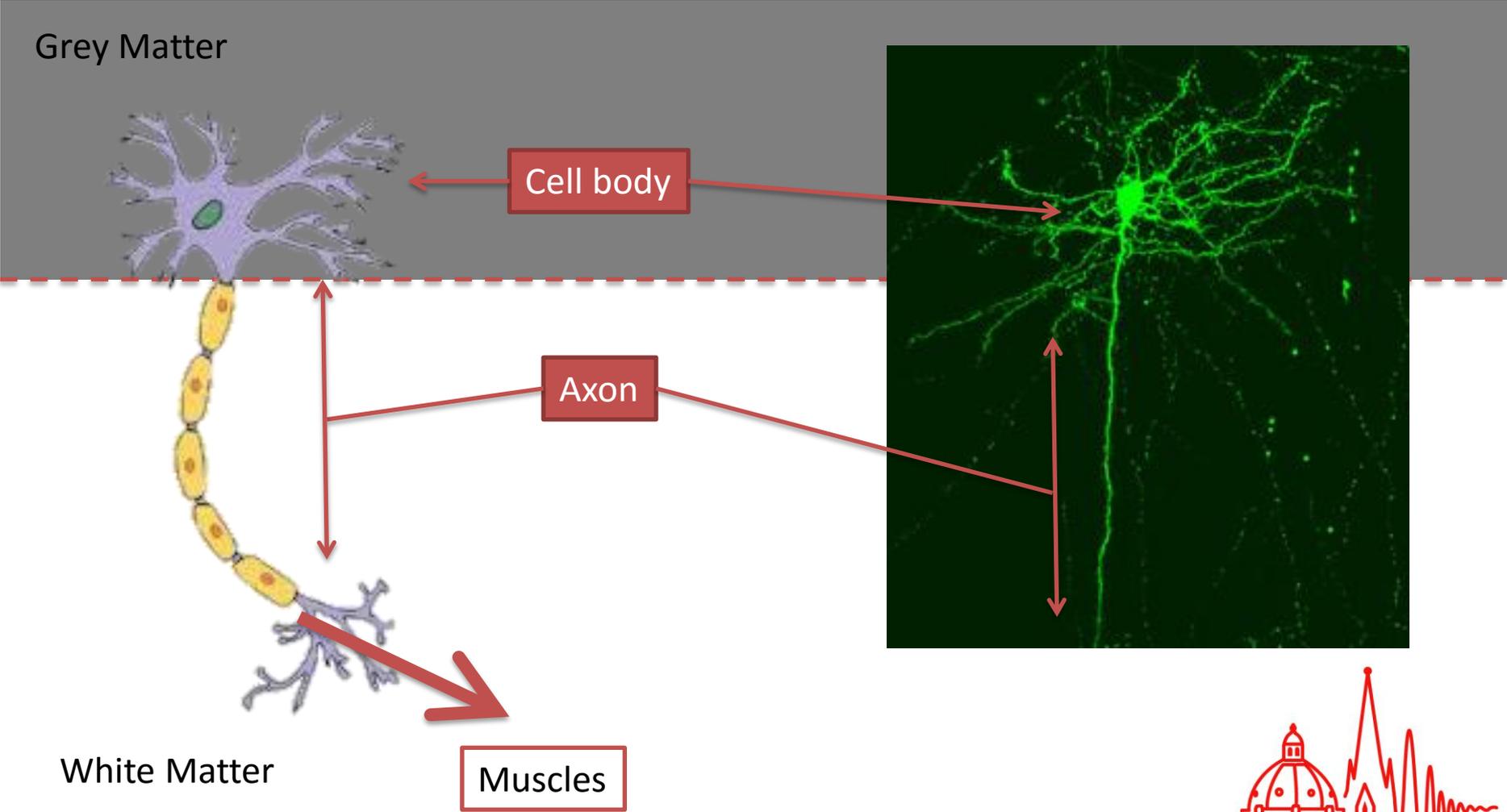


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Structure of a neuron (brain cell)



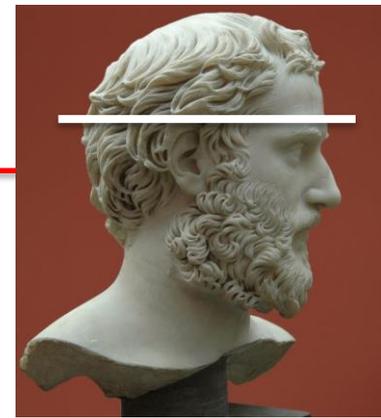
Grey matter – generates information



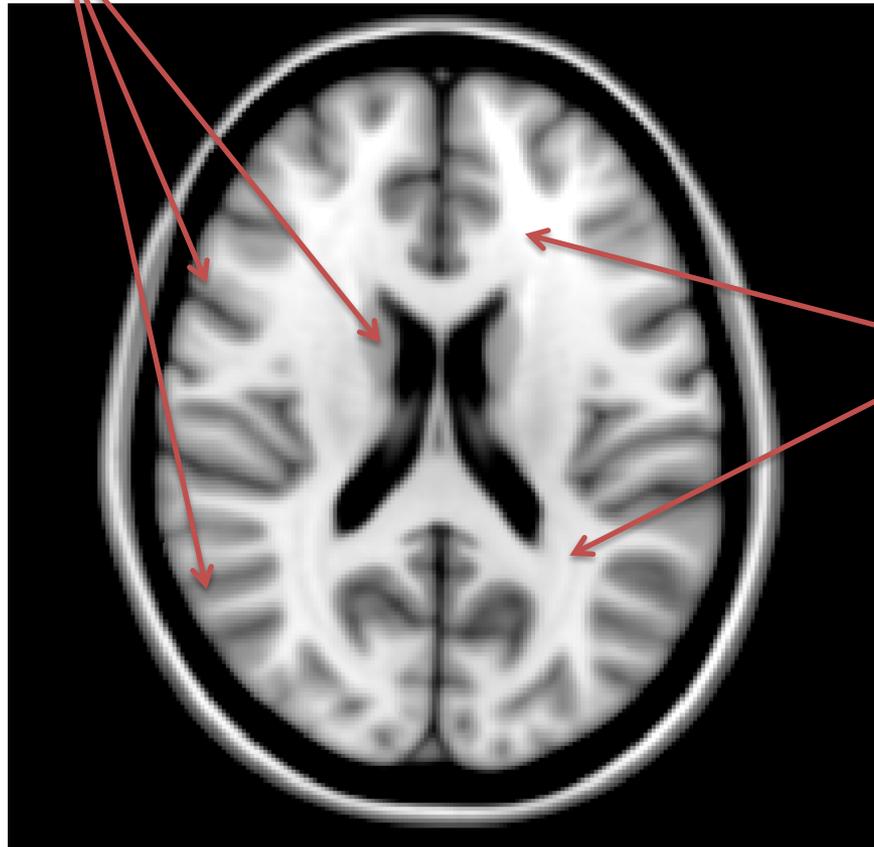
White matter - pathways out of the brain



Structure of the brain



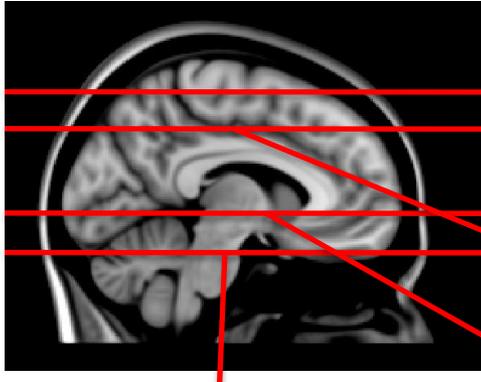
Grey Matter



White Matter



Motor Network



Supplementary Motor Area

Cerebellum

Primary Motor Cortex

Primary Motor Cortex

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After a stroke the paths out of the brain become blocked



Real life experience...



Click here to view the film clip 'Real life experience':
<https://www.youtube.com/watch?v=Zybxq96Hlrk>

But New paths can form



Recovery can and does happen

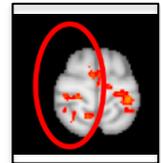


Click here to view the film clip 'Recovery can and does happen':

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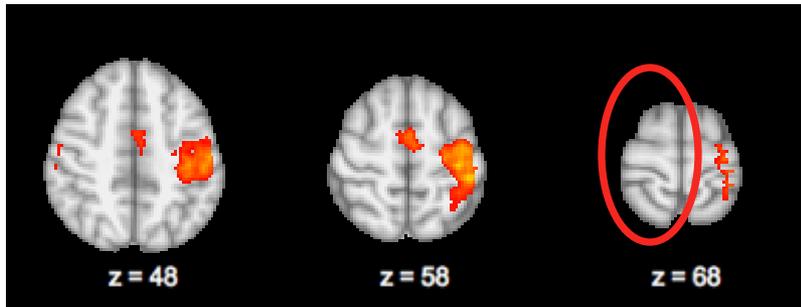
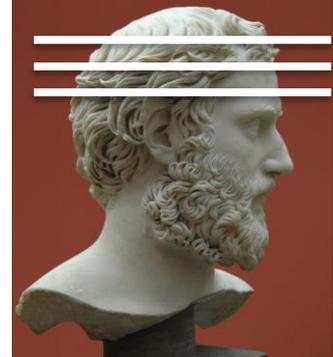


The more you do the better

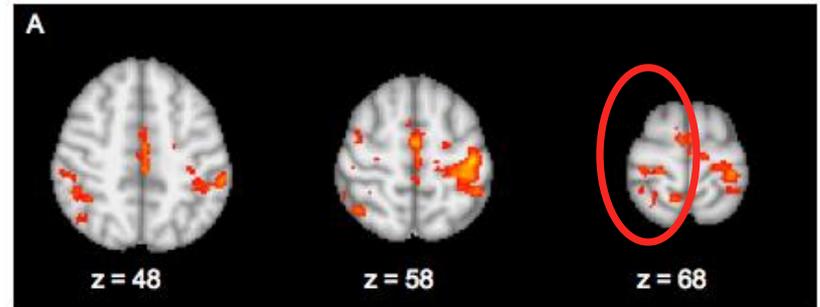


Click here to view the film clip 'The more you do the better':
<https://www.youtube.com/watch?v=5v2VUNfSgAo>

More of the brain is active when moving after a stroke

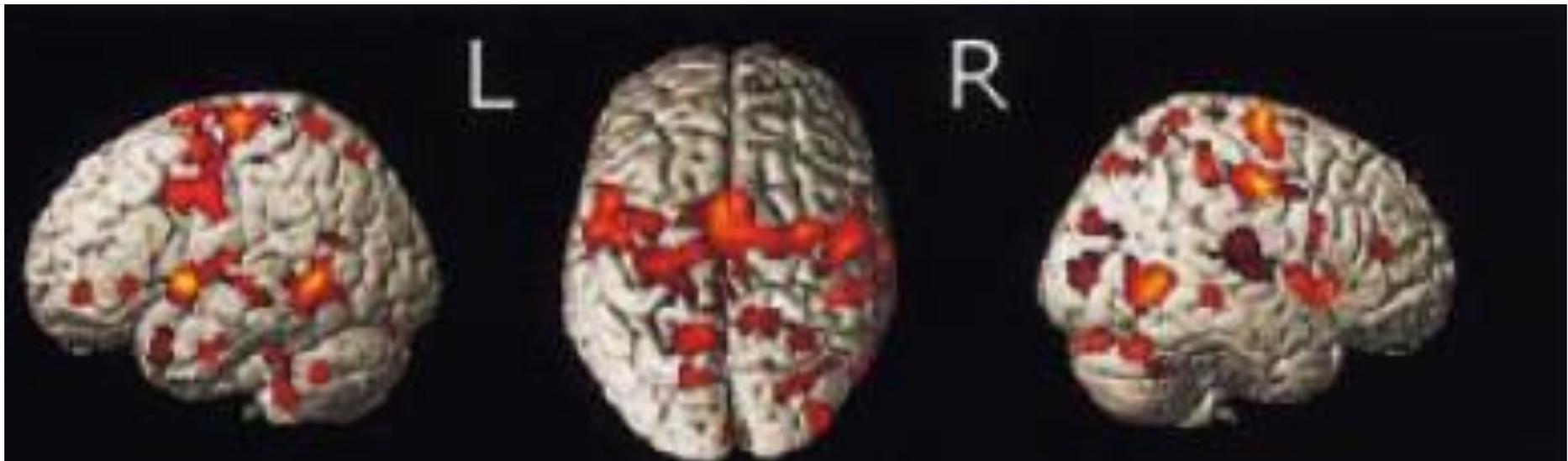


Controls



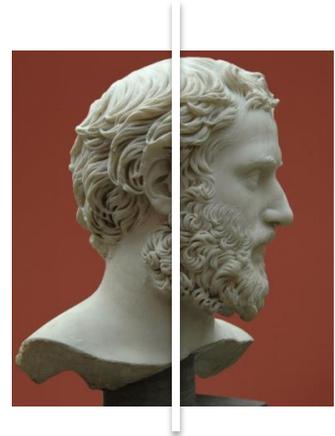
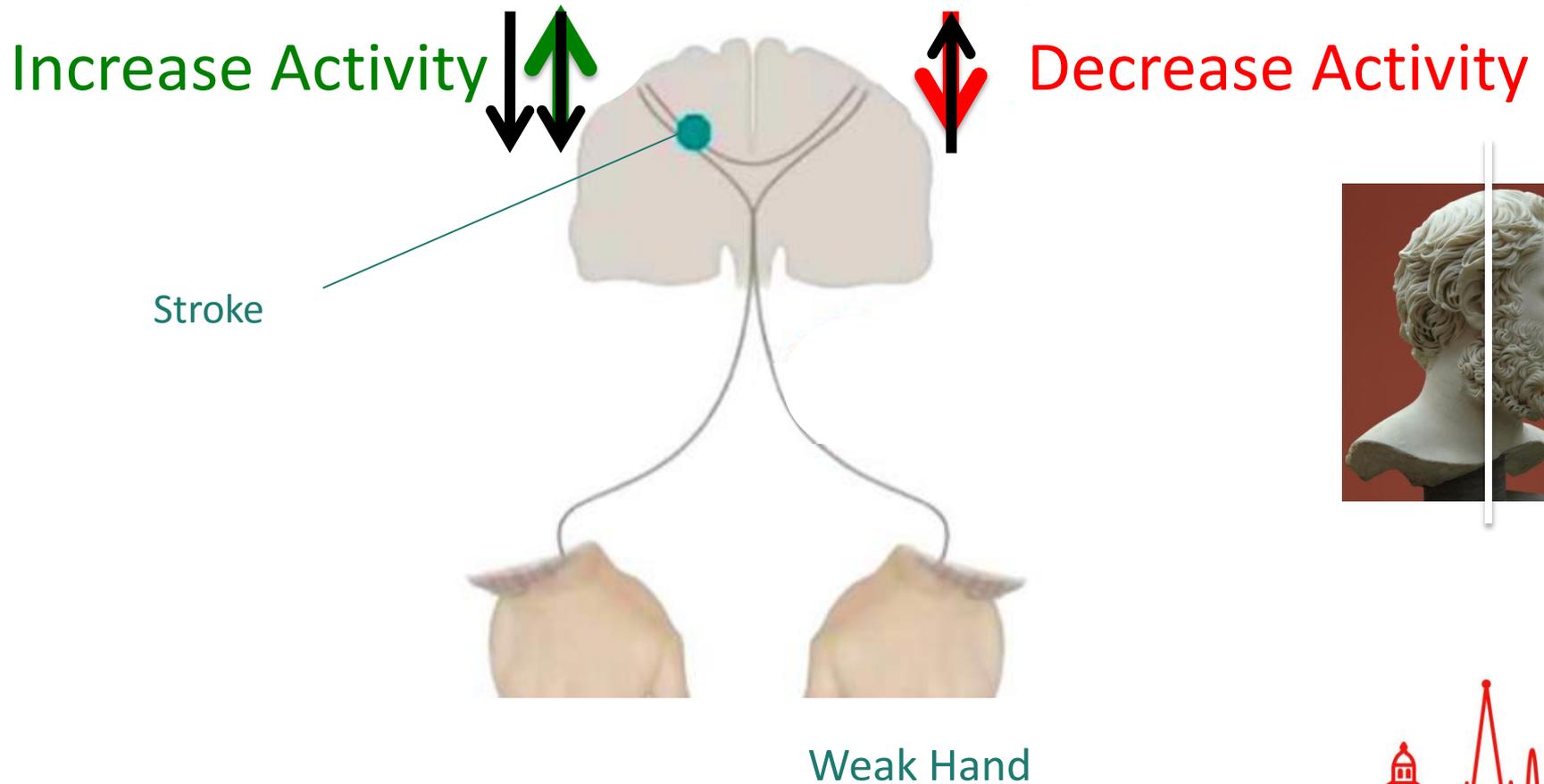
Post stroke

Much of the brain is activated to move the stroke-affected hand

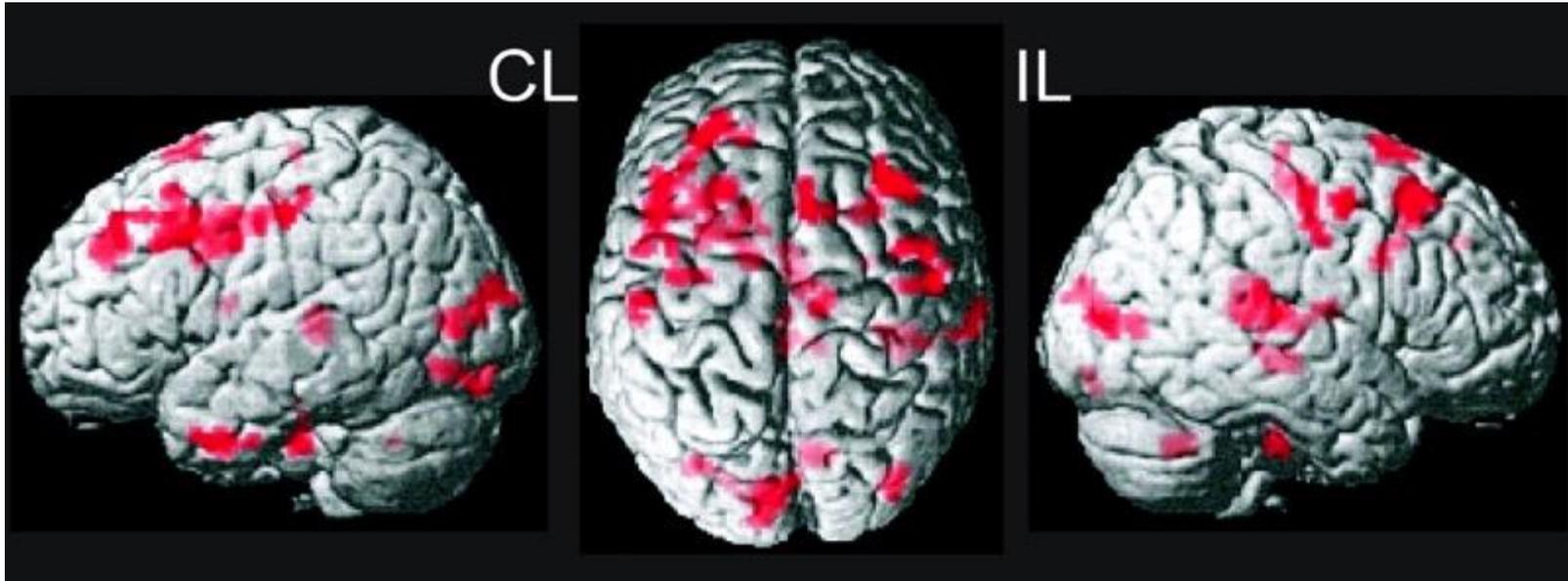


Ward et al, Brain, 2003

Targets in stroke neurorehabilitation - “rebalancing” the two sides of the brain

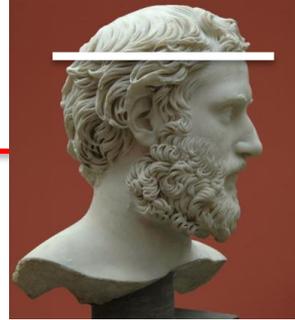


Recovery-related brain changes; sub-acute stages: 2-26 weeks

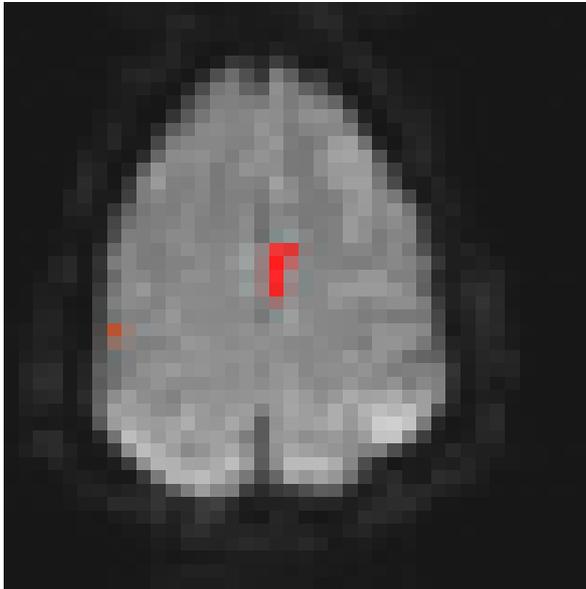


Across a group of chronic stroke survivors, **reductions** of activity in these regions were associated with improvements in clinical scores

Longitudinal study: Increased activity in the brain after rehabilitation

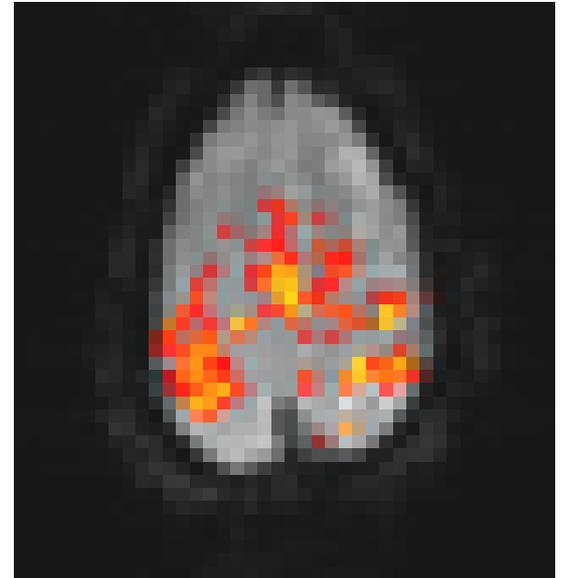


Pre



THERAPY

Post



Johansen-Berg et al, Brain, 2002



Recovery after a stroke



Recovery after a stroke
Sequence Learning



Recovery after a stroke
Sequence Learning
Motor Skill Acquisition

Learning to juggle (as a model for recovery!)

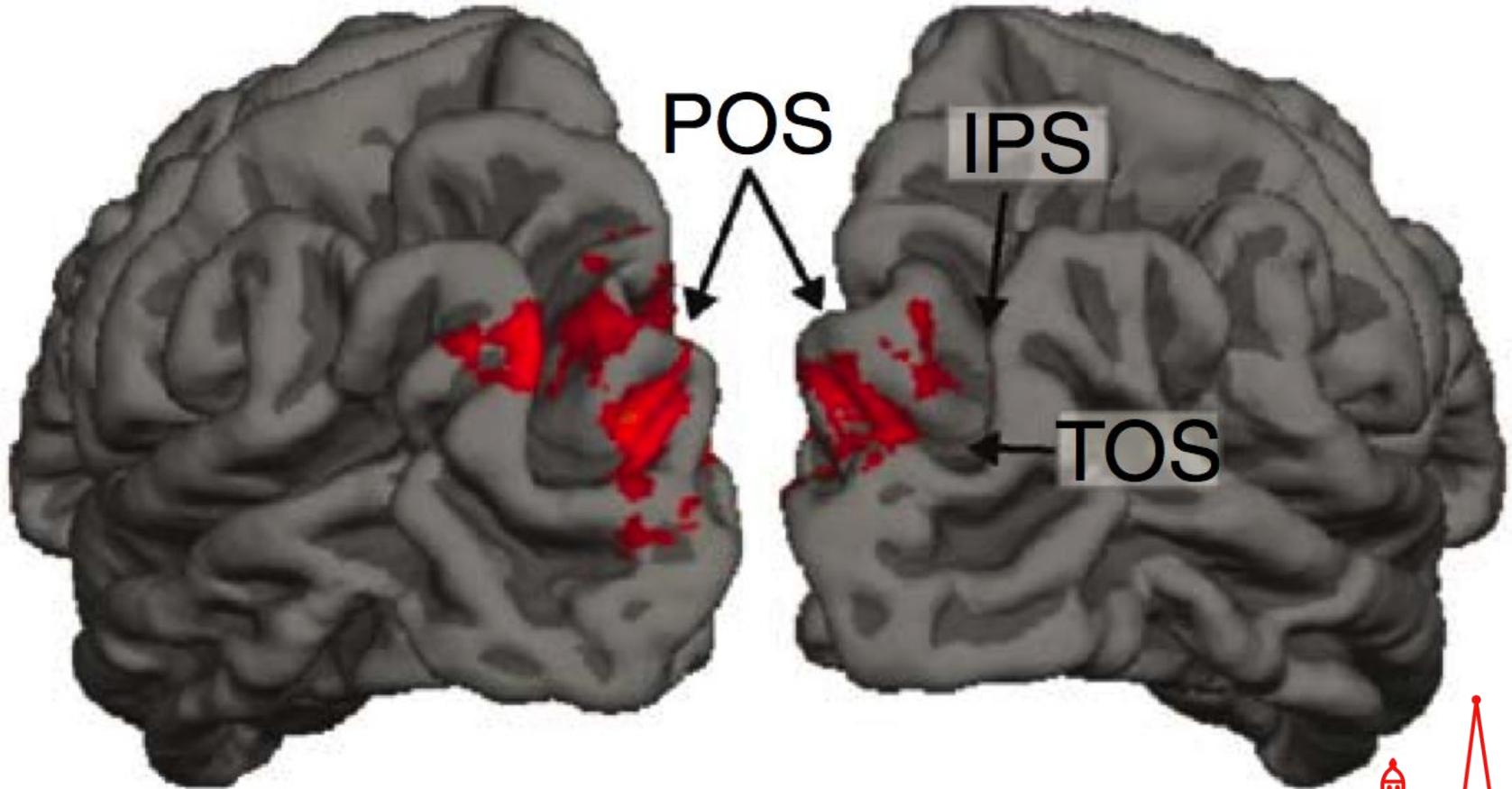
BASELINE SCAN



POST TRAINING SCAN

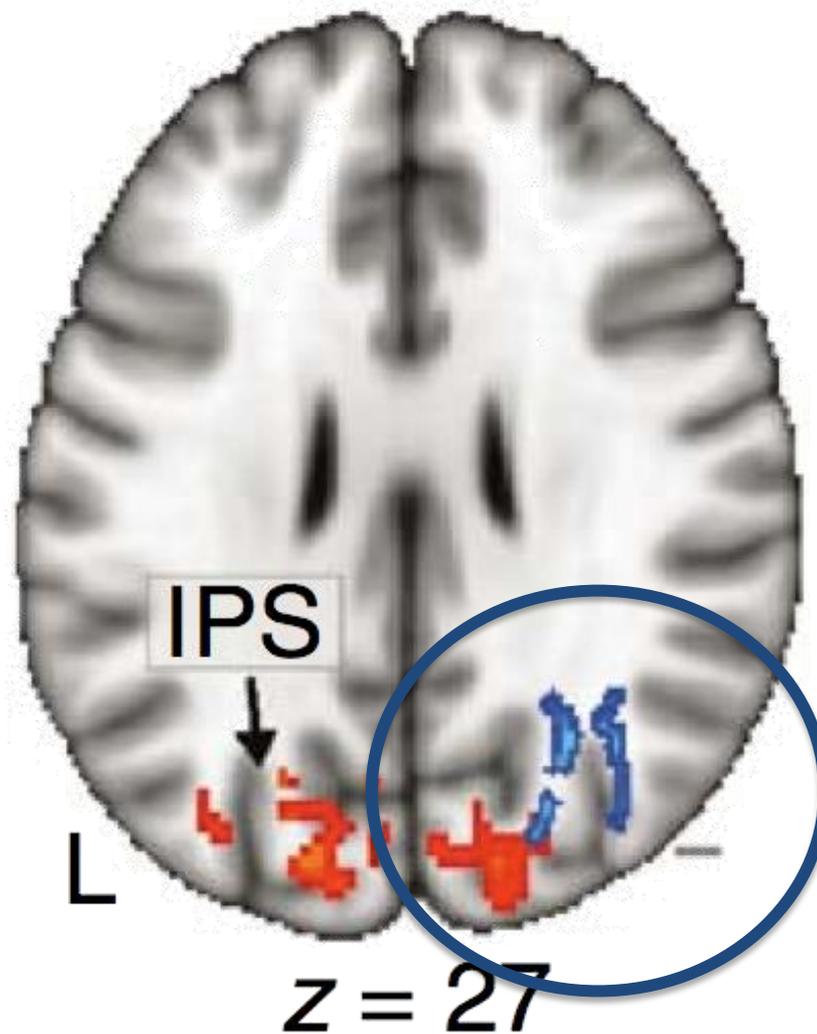
(Scholtz et al., 2009)

Increased Grey Matter after learning



(Scholtz et al., 2009)

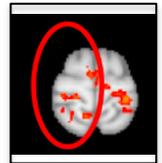
Increase in White Matter Organisation



(Scholtz et al., 2009)

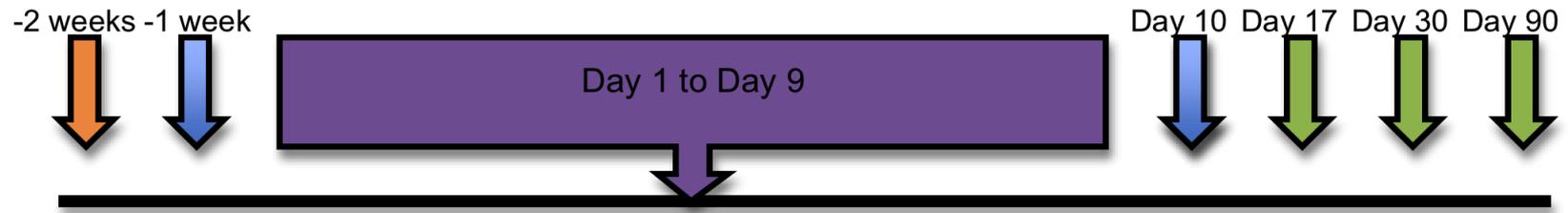
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Repeated sessions may lead to long term motor improvements in patients

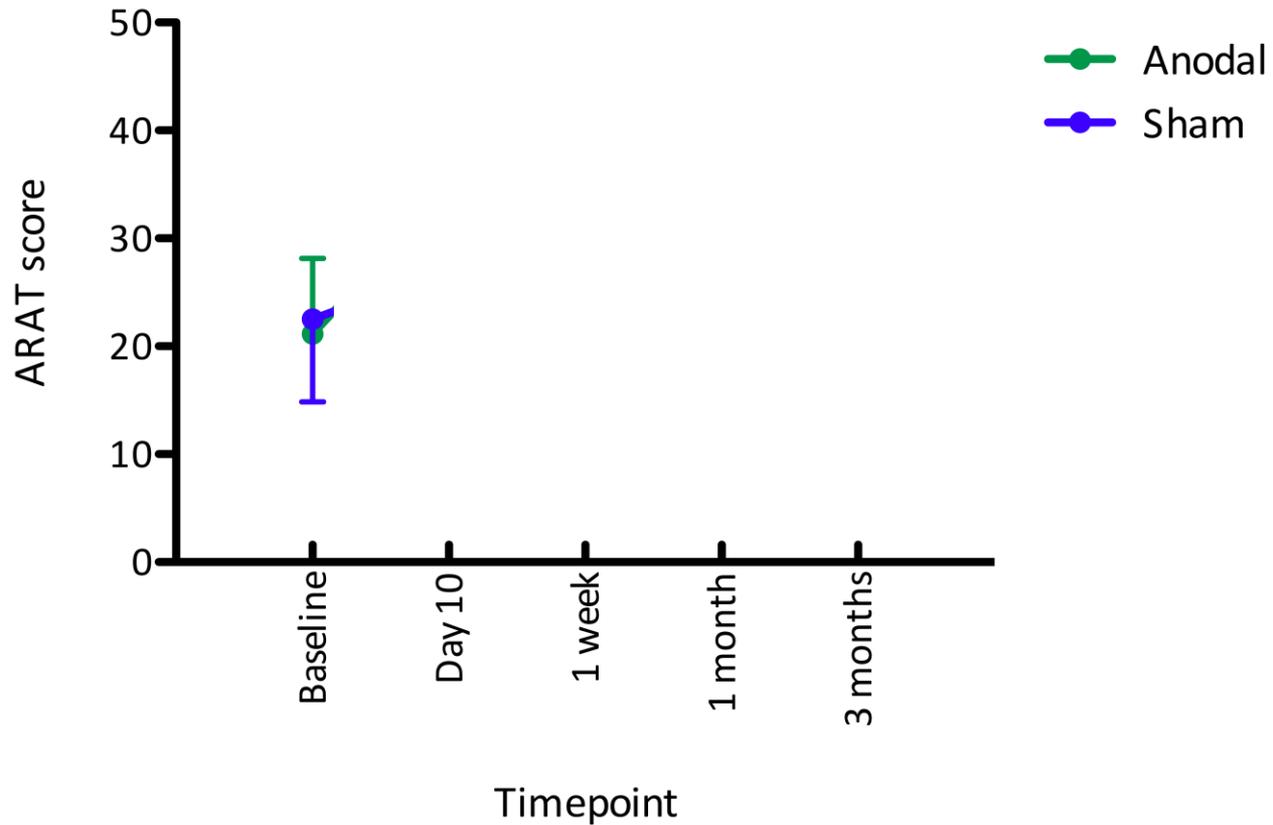


- Baseline Session: Including clinical measures and TMS
- MRI session
- Intervention: tDCS (anodal or sham) and motor training
- Follow-up sessions: Repetition of clinical measures

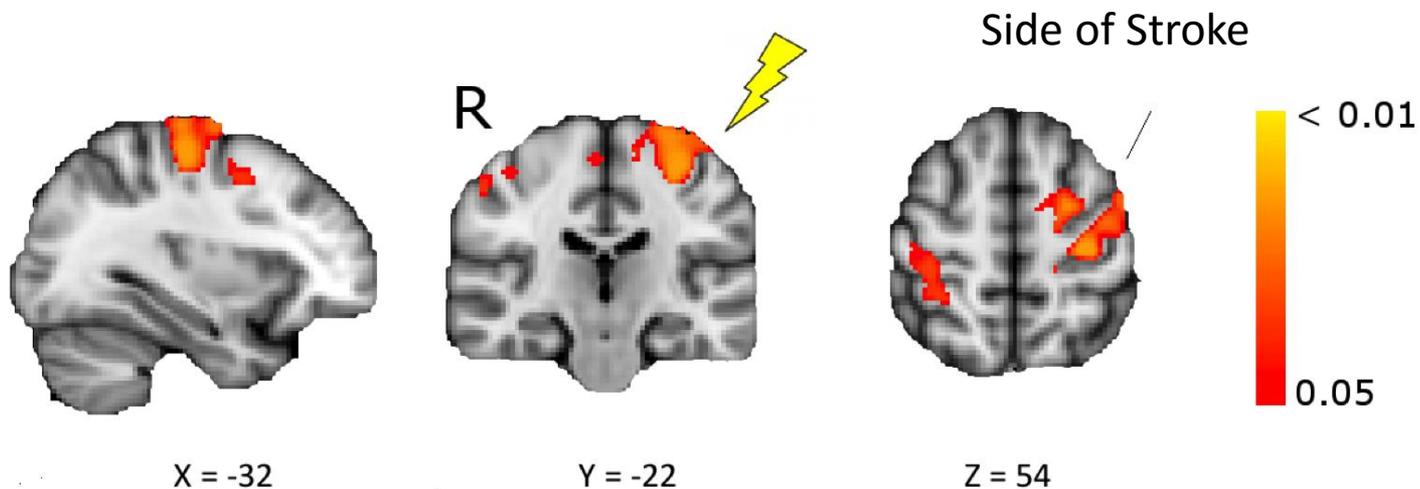
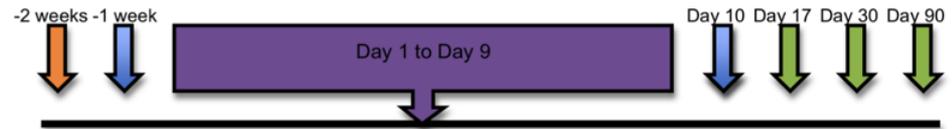
Daily motor training consists of simple, standardised exercises



Repeated sessions may lead to long term motor improvements in patients



People who made greater improvements also had greater increases in Grey Matter



Summary

- The more you do the better you will get.
- It is **NEVER** too late to improve (though things will slow down)
- The brain is able to change and adapt all the time
- New potential therapies are beginning to be developed that may help
- The more we understand about recovery the better those potential therapies will be

A last word to Jan....



Click here to view the film clip 'A last word to Jan':
<https://www.youtube.com/watch?v=U-xMOSTpEPQ>

Thanks

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