Plenary 3:
Can the brain rewire itself?

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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

Cell body

Axon

White Matter

Muscles
Grey matter – generates information
White matter - pathways out of the brain
Structure of the brain

Grey Matter

White Matter
Outline

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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’: https://www.youtube.com/watch?v=l2ASoedQa2M
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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
Targets in stroke neurorehabilitation - “rebalancing” the two sides of the brain

Increase Activity ➡️ Decrease Activity

Stroke

Weak Hand

Ward & Cohen 2004
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

Ward et al, Brain, 2003
Longitudinal study: Increased activity in the brain after rehabilitation

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!)

(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.

**Graph:**

- **Y-axis:** ARAT score
- **X-axis:** Timepoint
  - Baseline
  - Day 10
  - 1 week
  - 1 month
  - 3 months

**Legend:**
- Green: Anodal
- Blue: Sham

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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