

Recovery after stroke

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Stroke in NZ

- ▶ 9000 new strokes in NZ every year
- ▶ 3rd most common cause of death
 - 1 in 5 die within first month
 - 1 in 2 dead or dependent by 1 year
- ▶ Major cause of long term adult disability

Stroke in NZ

- ▶ Not restricted to the elderly
 - 1 in 4 people with stroke are working age
- ▶ Major problem in Maori/Pacific
 - Age of onset

Maori	56 y
Pacific	60 y
Europeans	73 y

RCT evidence of benefit with:

- ▶ Stroke unit care
- ▶ Ischemic stroke
 - aspirin
 - stroke thrombolysis
 - hemicraniectomy for malignant infarction
- ▶ Very few phase III rehabilitation studies

Mrs R, 46 yrs

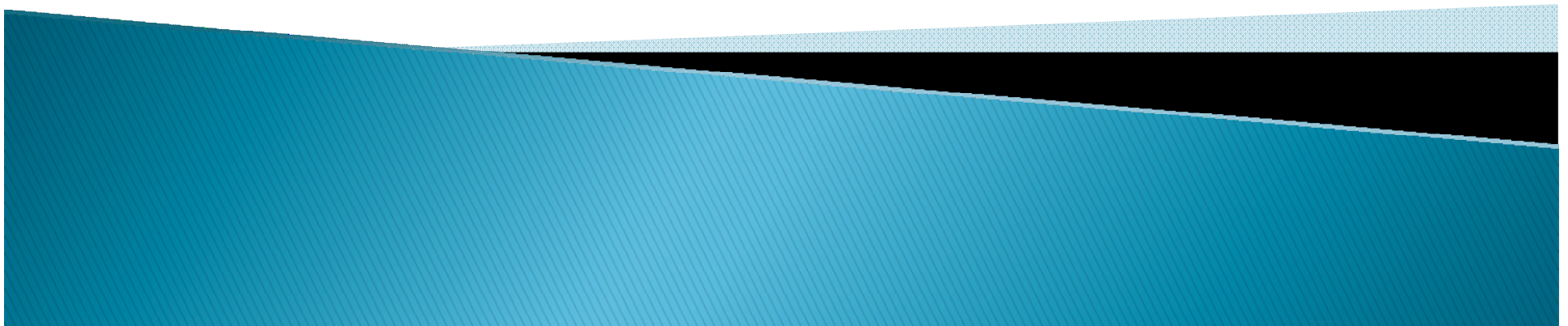
- ▶ Sudden onset
 - dysphasia & dense right sided weakness
- ▶ iv thrombolysis at 3 hours 40 mins
 - minimal improvement at 24 hours
- ▶ What are her prospects for further recovery?
- ▶ What mechanisms underlie further recovery?
- ▶ What treatments available to promote recovery?

Recovery following stroke

- ▶ Most survivors show spontaneous functional improvement
- ▶ Rehabilitation facilitates this improvement
- ▶ Occurs due to
 - behavioural changes = adaptation & compensation
 - recovery = re-organisation of brain with surviving areas taking over function of damaged brain

Neuroplasticity

The brain's ability to reorganize itself by forming new connections



Neuroplasticity & stroke recovery

- ▶ Neurons contributing to complex functions distributed throughout cortex with signals routed along multiple pathways
- ▶ This diffuse connectivity facilitates recovery

Following stroke

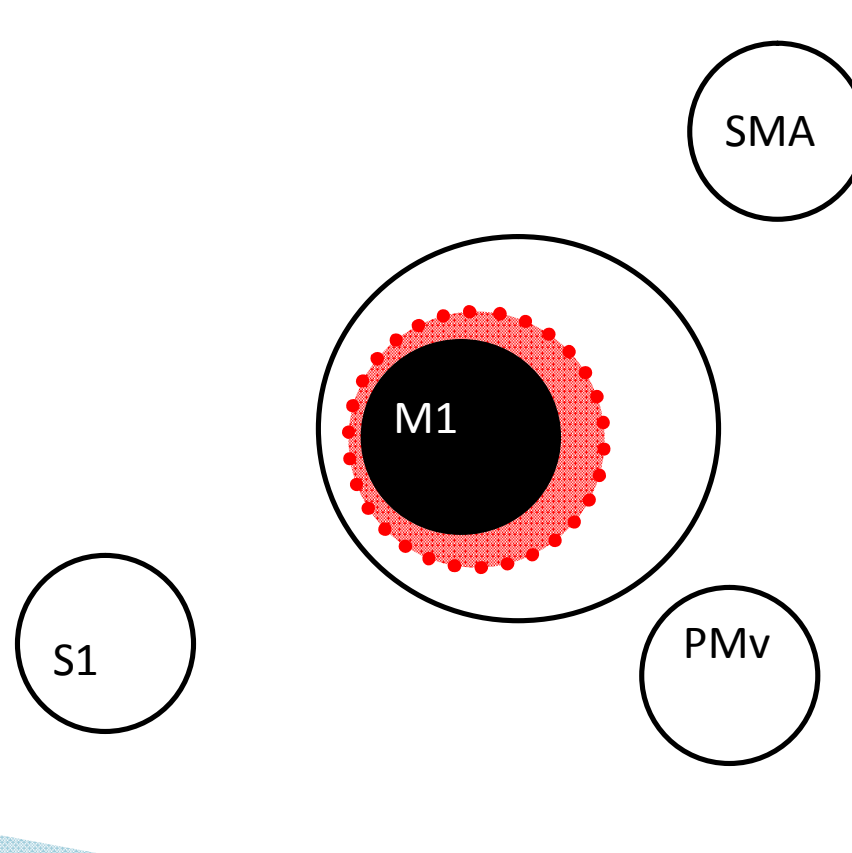
- ▶ Rapid unmasking of latent synapses
- ▶ Molecular & cellular changes
 - peri-infarct & connected areas excitable
 - axonal sprouting, synaptogenesis
- ▶ Compensatory circuits strengthened & refined by activity

Following stroke

- ▶ Rapid unmasking of latent synapses
- ▶ Molecular & cellular changes
 - peri-infarct & connected areas excitable
 - axonal sprouting, synaptogenesis
- ▶ Compensatory circuits strengthened & refined by activity
- ▶ Brain function re-mapped from damaged to surviving connected areas

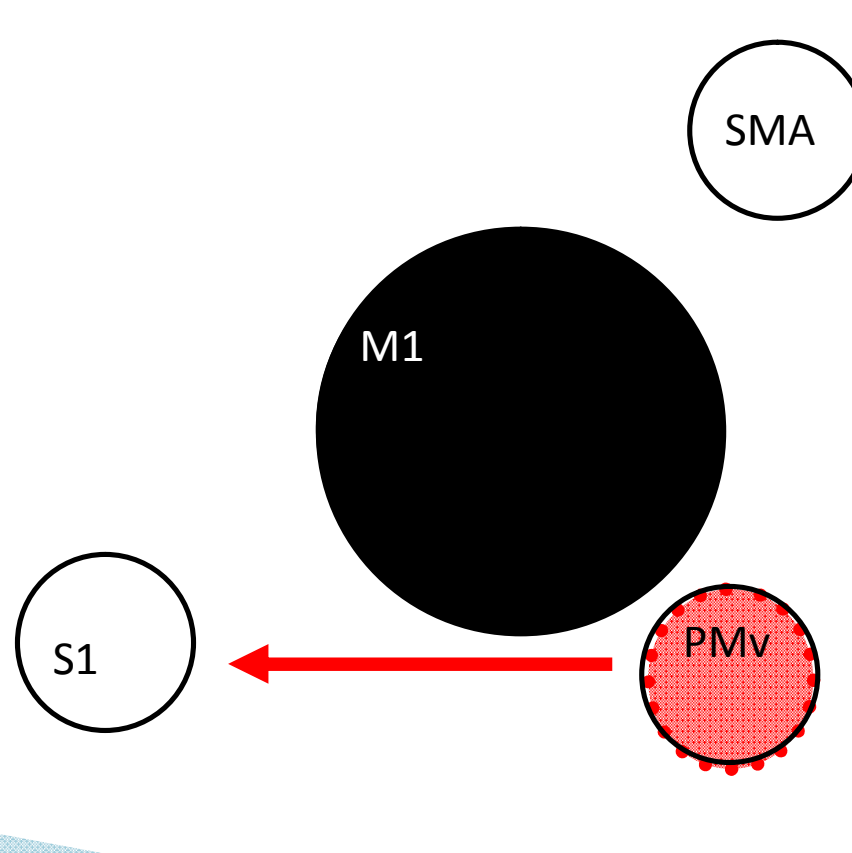
Rewiring of intracortical pathways

- ▶ Somatotopic shifts adjacent if small stroke



Rewiring of intracortical pathways

- ▶ More distant if larger strokes



Mrs R, 46 yrs

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Clinical state predicts outcome

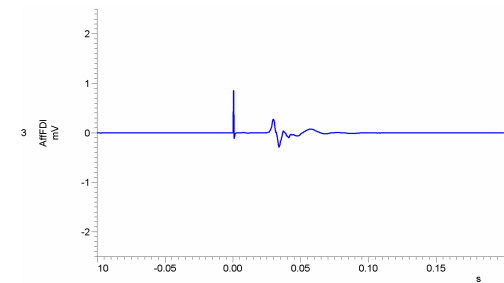
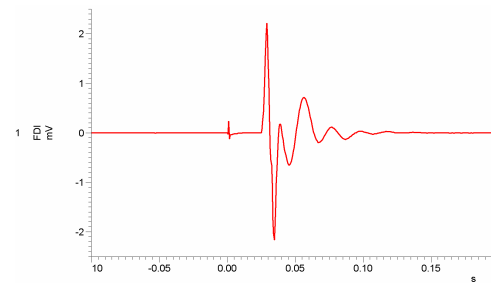
▶ SAFE score

- MRC grade for finger extn + shoulder abdn
- dichotomised into ≤ 7 or ≥ 8

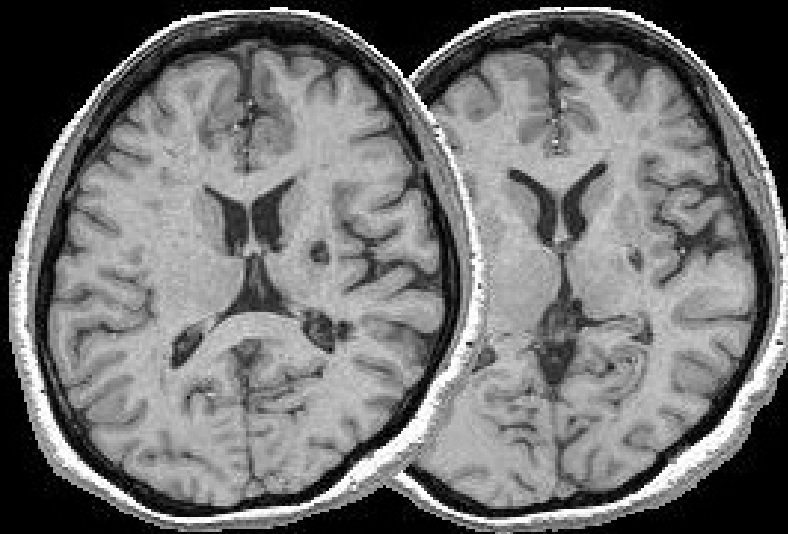
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Transcranial magnetic stimulation

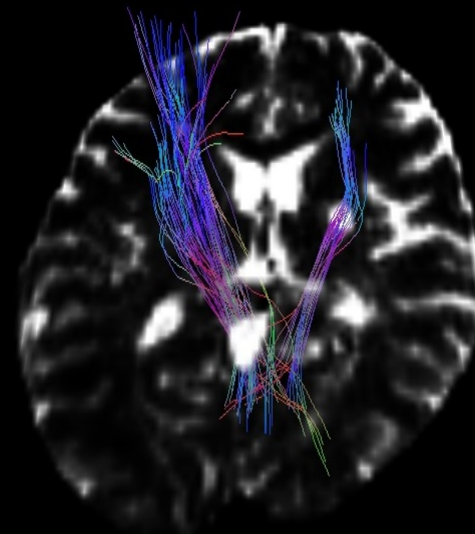
- ▶ Motor evoked potentials
 - presence/absence



MRI fractional anisotropy (FA)

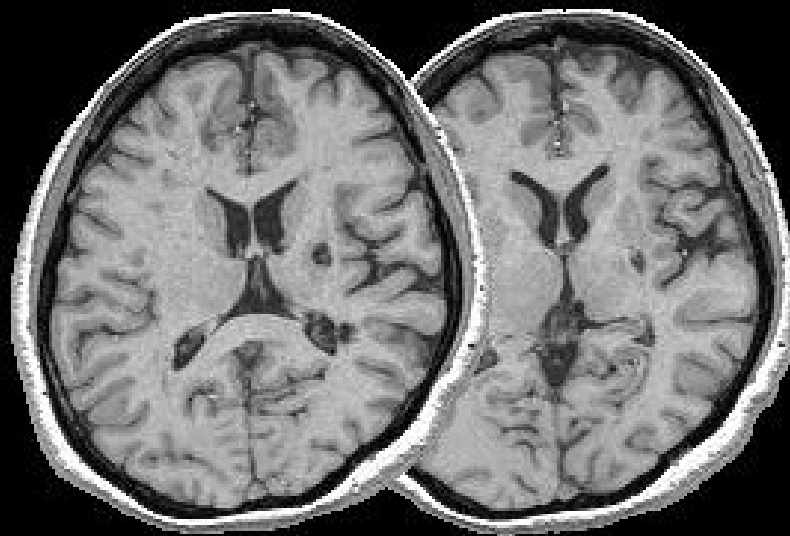


T1-WI

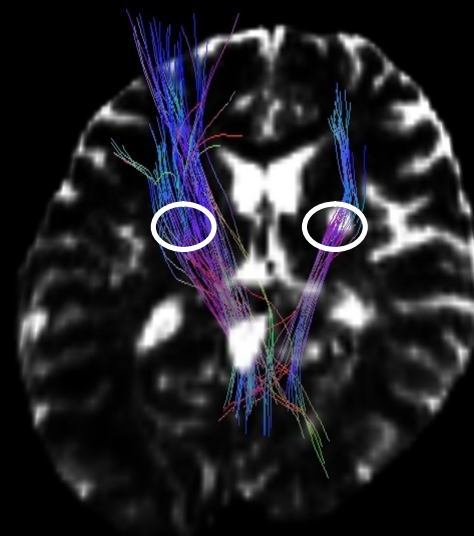


Diffusion tensor imaging

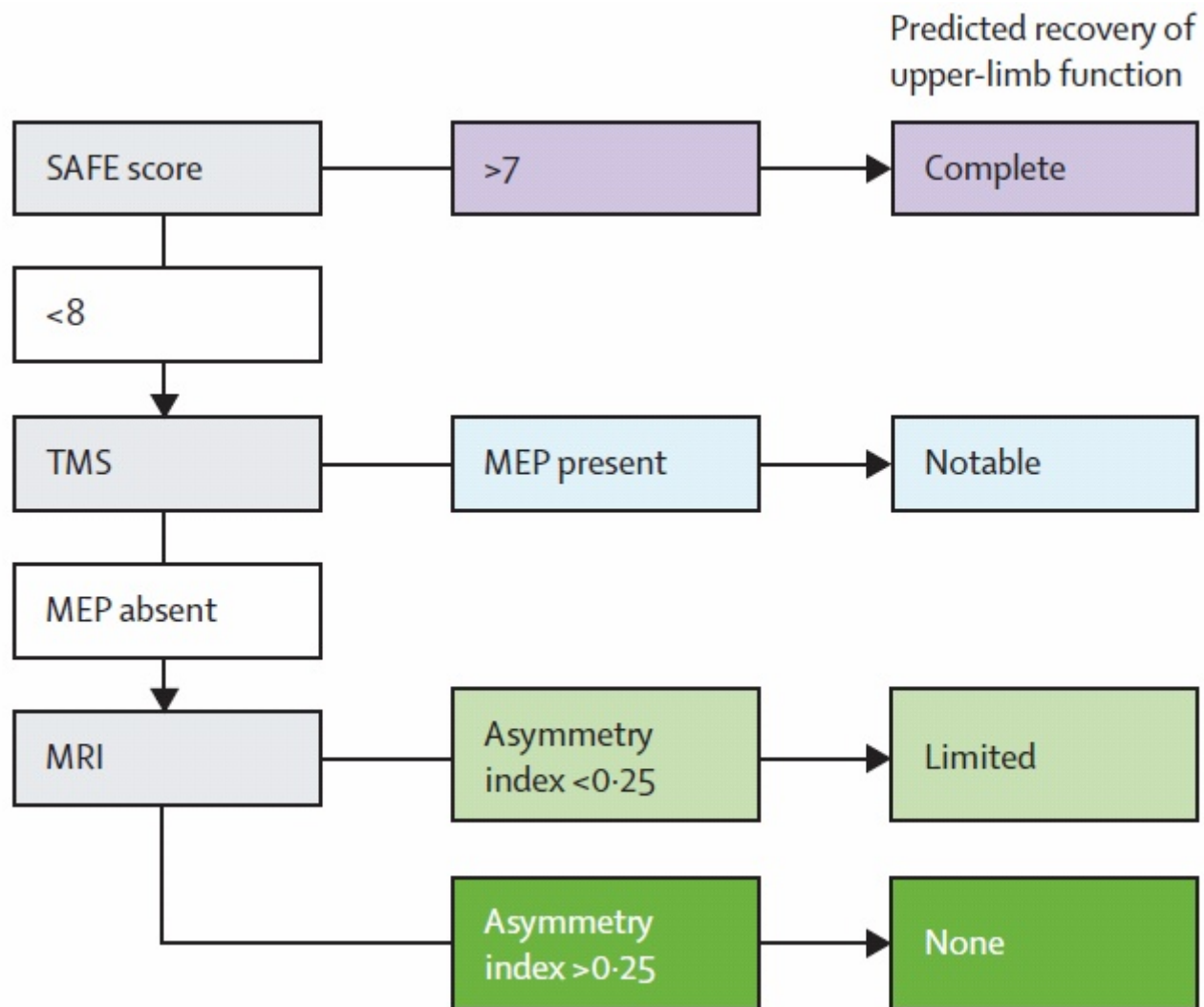
MRI fractional anisotropy (FA)



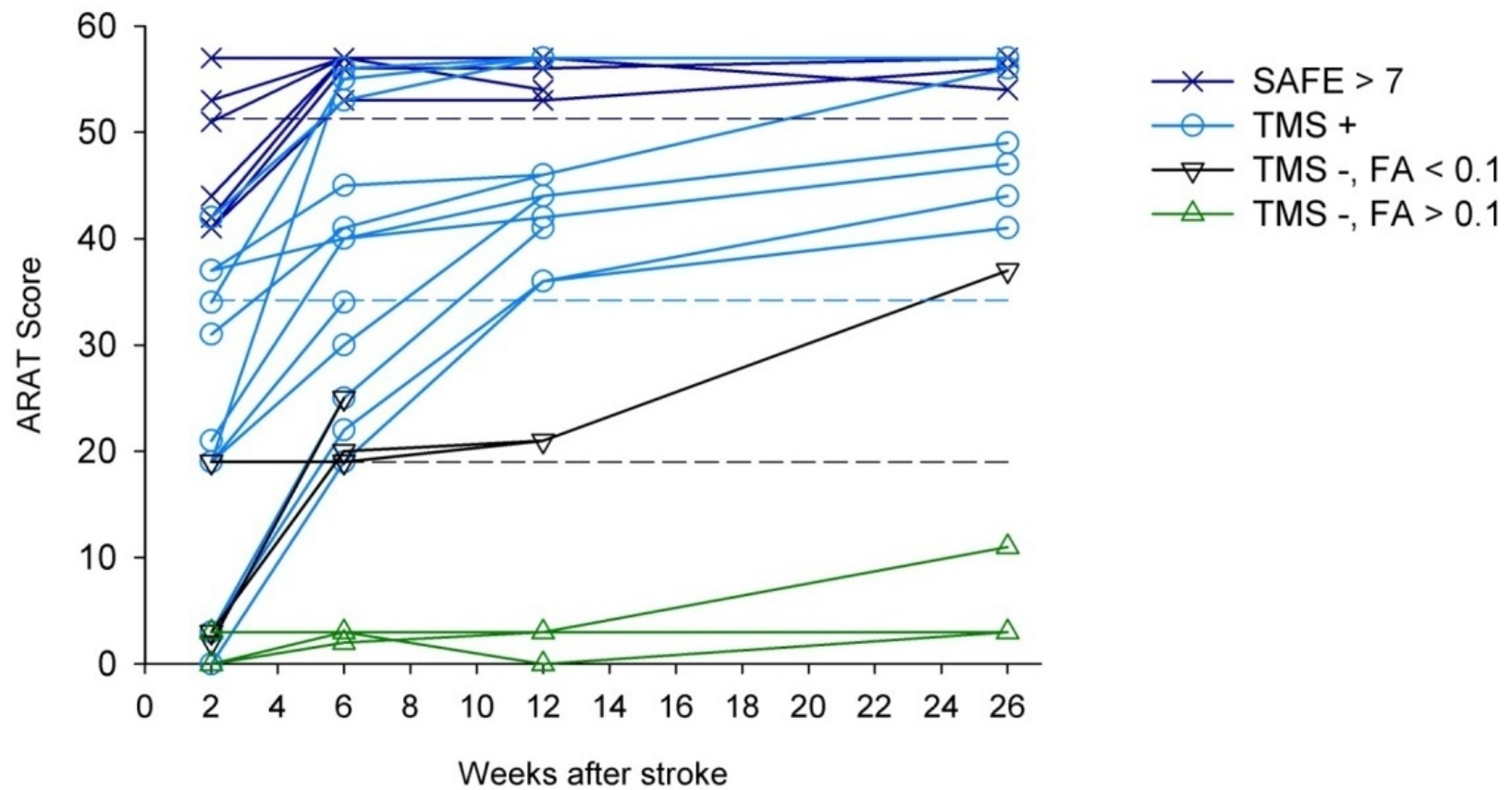
T1-WI



Fractional anisotropy asymmetry
index



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Mrs R, 46 yrs

- ▶ Sudden onset
 - dysphasia & dense right sided weakness
- ▶ iv thrombolysis at 3 hours 40 mins
 - minimal improvement at 24 hours
- ▶ What treatments on the horizon to promote recovery?

New repair/chronic phase therapies

- ▶ Currently few therapeutic options
 - physical therapy
 - occupational therapy
 - speech language therapy
- ▶ Wide range therapies under investigation
 - few tested in phase III clinical studies

Constraint induced movement therapy



www.rehabmed.emory.edu



www.schlaganfalltraining.de

Robotic stroke rehabilitation



www.acpinternist.org

www.sci-therapies.info/lokomat

New stroke rehabilitation therapies

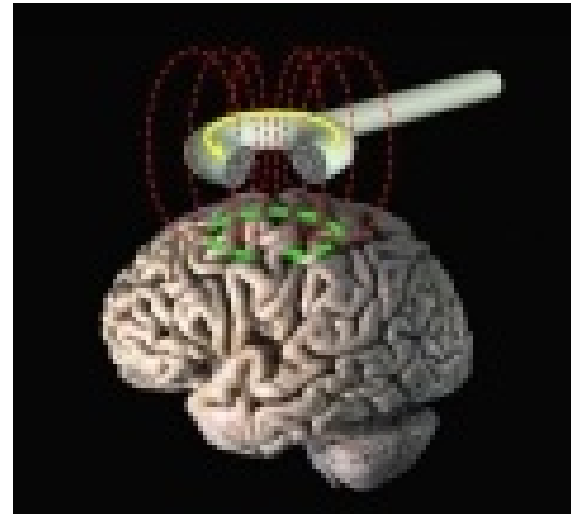
- ▶ Dopaminergic
- ▶ Cholinergic agents
- ▶ Amphetamines
- ▶ Serotonin reuptake inhibitors

Coordinated movement patterns

- ▶ Active–Passive Bilateral Training



Non-invasive brain stimulation

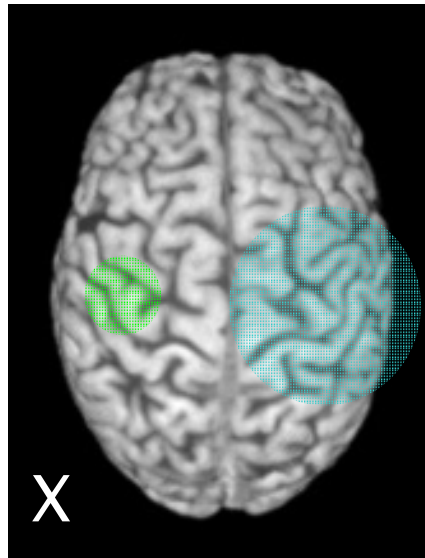


Non-invasive brain stimulation

Excite

Suppress

iTBS
Stroke side



cTBS

Stem cell therapy

- ▶ May improve function following stroke
- ▶ But
 - few cells enter the brain
 - little/no differentiation into neural cells
 - functional improvement within few days

Conclusions

- ▶ Acute stroke therapies benefit few patients
- ▶ Techniques are required to enhance response to rehabilitation therapies
- ▶ Multiple avenues of research but few phase III studies
- ▶ Unlikely there will be a one size fits all solution

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