

# Neuroplasticity against Demyelination “The Battle”



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*MONA ELSHERBINY*

MD NEUROLOGY

# *Definition*

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- Ability of the nervous system to **change** its activity in response to intrinsic or extrinsic stimuli by reorganizing its structure, functions, or connections.
- The functional reorganization of neural tissue, mediated by **Adaptation** within residual neural tissue.
- **Restructuring** and **Reshaping** neural networks as a result of experience, injury, learning, and healing.

# *Connectopathy*

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White matter neuroplasticity include

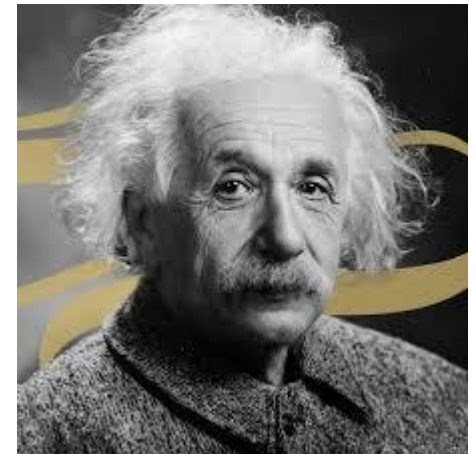
- Increased myelination
- Increased axon diameter
- Increased internode length
- Increased ion channel density

# *Evidence of neuroplasticity*

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## **Autopsy**

- **Vacant** parietal operculum region in the inferior frontal gyrus in the frontal lobe.
- More glial cells



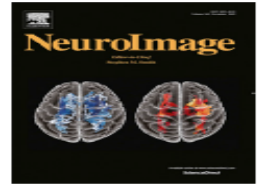
# Evidence of neuroplasticity



Contents lists available at [ScienceDirect](#)

NeuroImage

journal homepage: [www.elsevier.com/locate/neuroimage](http://www.elsevier.com/locate/neuroimage)



## Increased myelination plays a central role in white matter neuroplasticity

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### ➤ DTI

- FA increased
- AD increased
- RD decreased

### ➤ Myelin water imaging (MWI).

### ➤ Functional MRI (BOLD).

# *Impact of neuroplasticity*

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- **Motor** functions (recovery of attack)
- **Visual** recovery after acute demyelinating optic neuritis typically occurs within weeks despite permanent axonal loss
- **Clinico- radiological paradox**
- **Cognitive** functions (SDT with Soponimod).

# *Correlation to phenotypes*

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- CIS (>50% cognitive affection)
- RRMS (PIRA, RAW, attack residual)
- SPMS
- PPMS

# *Enhancing neuroplasticity*

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## ➤ Pharmacological

- DMD
- Amantadine
- Dalfampredine
- DMDs

## ➤ Rehabilitation

- Mirror therapy
- Gait training
- Mental exercises



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➤ Transcranial magnetic stimulation (TMS).

➤ Neurofeedback.

# *To win the battle*

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- ❖ Early diagnosis
- ❖ Best DMD
- ❖ Enhance neuroplasticity as fast as possible



*THANK YOU*

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AD (measures the amount of water diffusing along the tracts in a voxel, which makes it more sensitive to factors effecting axonal tract integrity (i.e., **axonal injury or reduced axonal caliber may lead to a decrease of AD**)

RD measures the amount of water traveling perpendicular to the tract, making it more sensitive to the cross-sectional extent of myelination (i.e., **increased myelination leads to reduction of RD**)