

Alterations in white and grey matter in the brain and their impact on cognition

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Different areas of the brain are responsible for various functions. Grey (**GM**) and white matter (**WM**) play a significant role in all aspects of human life. **GM** contains a large number of neurons, enabling it to process and release information through axon signaling in the **WM** [2]. The **WM** constitutes a network of nerve fibers that facilitates communication and the exchange of information between different areas of the **GM**, which is primarily responsible for processing information, cognitive function, and motor function.

Although the cerebral cortex has long been regarded by neuroscientists as the primary site of cognitive function, the **WM** and **GM** of the brain are now recognized as being equally important for cognition [3]. **WM** tracts are essential for mediating connectivity and organizing human behaviour, working in concert with **GM** to enable the extraordinary range of human cognitive capacities. There is ample behavioural neurology evidence that **WM/GM** lesions and dysfunction are relevant to neurodegenerative disorders, including Alzheimer's disease [4]. Similarly, severe WM lesions are associated with cognitive impairment, global functional decline, cerebrovascular accidents, mood disorders, and gait and balance dysfunction. WM lesions are also associated with GM atrophy and accelerated neurodegeneration.

Recent research refers age-related **WM/GM** lesions are irreversible and progressive. Therefore the important to discuss emerging concepts regarding the prevention and treatment of cognitive dysfunction associated with **WM/GM** disorders [5], studies agree among others on the following suggestions to preserve cognitive alterations related to **WM/GM**:

- ✓ Aerobic physical activities which improve cardiorespiratory fitness are beneficial for cognitive function in healthy older adults, with effects observed for motor function, cognitive speed, delayed memory functions and auditory and visual attention [6].
- ✓ Avoid central arterial stiffening which is associated with WM damage and GM volume loss in older adults and also linked to cerebrovascular diseases, this can be done involving a holistic lifestyle approach focused on regular **aerobic exercise**, a plant-rich **Mediterranean diet**, **quitting smoking**, managing weight, controlling blood pressure, and limiting salt, alongside considering supplements like Vitamins D and K to help manage calcium and reduce calcification, all crucial for maintaining artery flexibility [7].

- ✓ Last but not least, it is recommended to adopt a vigilant stance on the changes related to emotional status is a part of an integral healthy lifestyle, since depression and fatigability were associated with various white matter integrity changes, which correlated with biochemistry biomarkers all related to inflammation [8].

Once there is lesions in the **WM/GM** it cannot be reversed [9], hence the importance of taking into account all of the lifestyle habits related to prevent its deterioration, studies indicates that the control of modifiable risk factors by, for example, having a healthy diet or doing physical exercise, represents a valuable prevention strategy to take care of the cognition from the deep inside.

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