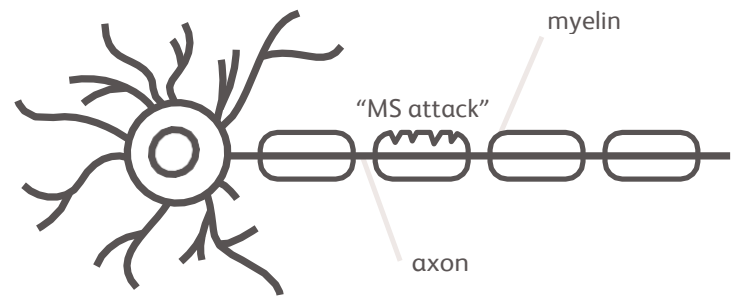


Multiple Sclerosis and the Brain

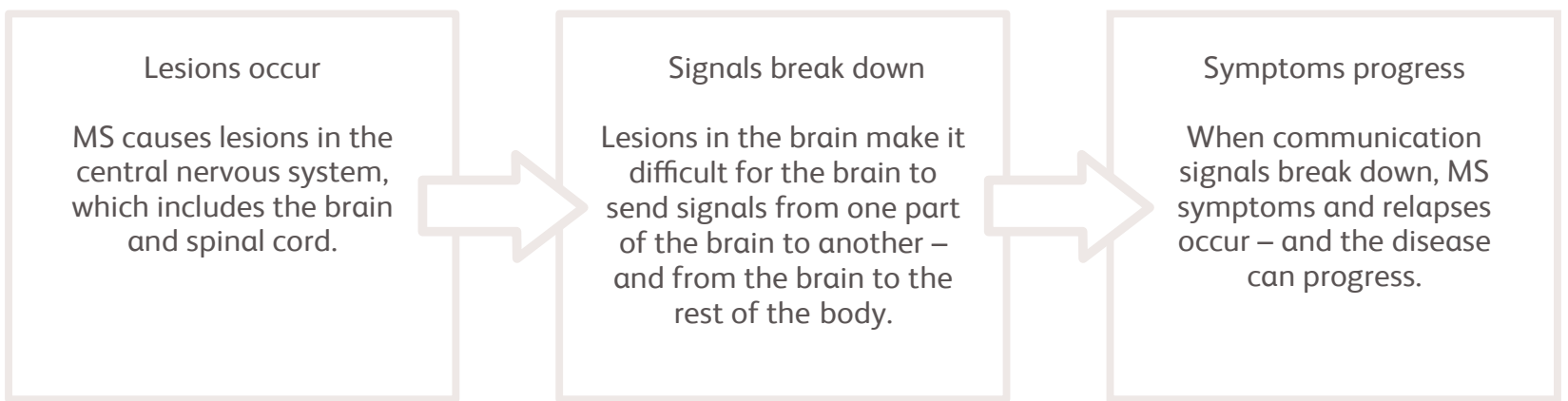
About Multiple Sclerosis

Multiple sclerosis (MS) is a disease in which the immune system attacks the protective myelin sheath (a pale fatty substance) that covers the nerves.¹ The myelin damage disrupts communication between the brain and the rest of the body.² Ultimately, the nerves themselves may deteriorate – a process that's currently irreversible.³



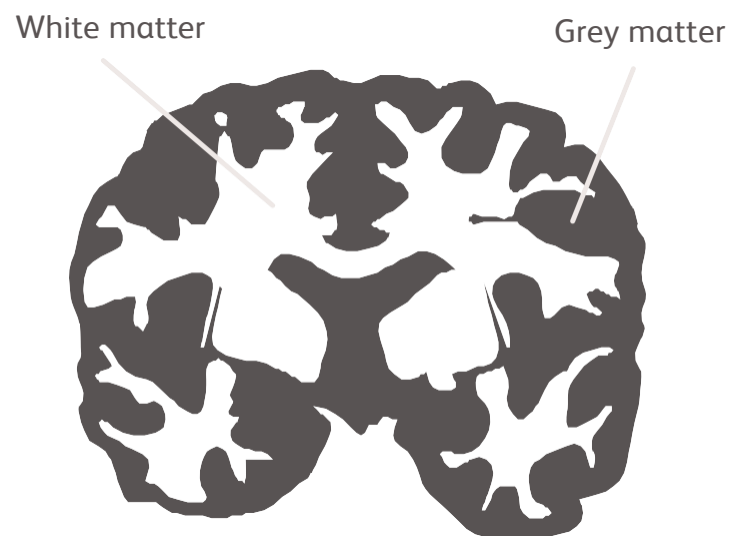
How MS Affects the Brain

MS causes the immune system to “attack” the myelin, creating damaging lesions within the central nervous system (CNS).

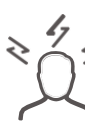


Brain Matter & Lesions


The brain is made up of two types of tissue: **grey matter**, which is where communication signals start, and **white matter**—which carries messages from one area to another. MS lesions occur in both of these areas.



For many years, researchers focused primarily on white matter when it came to MS. However, recent research has revealed that lesions and a decrease in white and grey matter (also known as brain volume loss) can have a much greater impact on MS than once believed.

 Damage to white matter can cause physical symptoms such as:^{4,5}

- Fatigue
- Numbness
- Sexual problems
- Mobility problems
- Pain
- Vision problems
- Muscle spasms
- Slurred speech
- Incontinence

 Damage to grey matter can cause a decline in physical ability as well as cognitive and emotional symptoms, which may include:^{5,6}

- Depression
- Anxiety
- Brain fog
- Slowed thinking
- Telegraphic speech (efficient use of language, with short sentences and simple words)
- Difficulty recognizing facial expressions and empathizing with others
- Difficulty with spatial awareness
- (judging distances and visualizing shapes)

Cognitive symptoms of MS vary and may correlate to either direct brain damage or result from the psychosocial symptoms of the disease. For example, depression and anxiety can be caused by damage within the brain, but can also be caused by the social isolation associated with other MS symptoms.⁷



Early diagnosis and treatment are important in helping preserve physical and cognitive functioning in people living with MS.



1. National Multiple Sclerosis Society. Definition of MS. www.nationalmssociety.org/What-is-MS/Definition-of-MS. Accessed 3 April 2020.
 2. National Multiple Sclerosis Society. What is Myelin? <https://www.nationalmssociety.org/What-is-MS/Definition-of-MS/Myelin>. Accessed 3 April 2020.
 3. National Multiple Sclerosis Society. What Causes MS? <https://www.nationalmssociety.org/What-is-MS/What-Causes-MS>. Accessed 3 April 2020.
 4. National Multiple Sclerosis Society. MS Symptoms. Available at: <https://www.nationalmssociety.org/Symptoms-Diagnosis/MS-Symptoms/>. Accessed 04 2019.
 5. NHS. MS Symptoms. Available at: <https://www.nhs.uk/conditions/multiple-sclerosis/symptoms/>. Accessed 14 April 2020.
 6. Ayache SS. Facial emotion recognition, theory of mind and empathy in multiple sclerosis. *Fortschritte der Neurologie-Psychiatrie*. 2017 Nov ;85(11):663-674.
 7. Seigert R.J. Depression in multiple sclerosis : A review. *Journal of Neurology, Neurosurgery & Psychiatry*. 2005 Apr; 76(4): 469–475.