MSc Human and Biological Robotics

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HCARD Report 2: Neurological Disorder

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Multiple Sclerosis (MS)

MS was first recognised as a disease around 150 years ago. The disease manifests itself as a gradual breakdown of the Central Nervous System (CNS), inhibiting its ability to perform the task of the affect area or areas. According to the University of California (San Francisco), 400,000 Americans have been diagnosed with MS, while the MS Society estimates that 100,000 people in the UK have MS (*San Francisco, University of California: Multiple Sclerosis*, n.d.) (*Multiple Sclerosis Society*, n.d.). That's 0.12% and 0.15% of the countries' populations respectively. The disease is prevalent in young adults (20- to 30-years-old) and affects around twice as many women than men in the US, and two to three times as many women than men in the UK (*Multiple Sclerosis Society*, n.d.) (*NHS Multiple Sclerosis*, 2016). That being said, MS is rare in children with only 5 to 10% of young people with MS shows symptoms before the age of 16.

Causes: Multiple Sclerosis (MS) is an autoimmune disease affecting the brain and spinal cord. More specifically, the Myelin sheath which coats nerve cells allowing signals to travel fast around the body, is attacked by the immune system. This causes degradation and scaring of the Myelin, sometimes as deep as the nerve. This scaring is known as sclerosis. This results in slow and/or disrupted nerve signals in the CNS.

The causes of MS are on the whole unknown, however, it is thought to be as a result of a combination of environmental and genetic factors, although it is not thought to be hereditary.

It is believed that developing MS is somewhat, but not wholly, dependent on genetics. This is known from studies on identical twins. If it were entirely genetic, it would be expected that if one identical twin were to develop MS, the other would too. In fact, it turn out this is the case in around 1 in 4 of pairs of identical twins (*MS Trust*, 2017). Furthermore, it is reported by the University of California that 5% of patients a have a brother or sister with MS and 15% have a close relative with MS (*San Francisco, University of California: Multiple Sclerosis*, n.d.). The MS Society reports that if one of your parents or siblings have MS, you have a 1.5% and 2.7% chance of developing MS respectively (*Multiple Sclerosis Society*, n.d.).

While genetics may give a predisposition for developing MS, the triggers are thought to be environmental. Some of the environmental factors include viral infections, lack of vitamin D and smoking.

Diagnosis and Symptoms: It is important to recognise that there are two types of MS: relapse-remitting and progressive MS. Relapse-remitting MS occurs in ebbs and flows, where your CNS goes through periods of degradation and recovery. These period of recovery can last years before a relapse occurs. Although the recovery during remission is not always complete, the symptoms diminish considerably. The reasons for relapse are not known for sure but experts believe that stress, pregnancy and viral infections can all trigger a relapse. Around 85% of MS patients are diagnosed with relapse-remitting MS. Those patients who go on to develop constant symptoms are said to have secondary progressive MS, while those who recover without relapse are said to have benign MS.

Primary progressive MS is a constant and gradual breakdown of the myelin sheath, without periods of remission. This results in the severity of the symptoms increasing over time until you are unable to perform tasks at all in some cases.

There are many different symptoms of MS depending on the nerve pathway which is affected. Few people will experience all of the symptoms, especially all at once. Some of the common symptoms are listed below (*San Francisco, University of California: Multiple Sclerosis*, n.d.; *MS Trust Symptoms*, 2017; *NHS Multiple Sclerosis*, 2016):

- Fatigue/depression
- Issue with muscle control incl. spasms, tremors, stiffness
- balance/ dizziness
- visual problems
- bladder problems
- speech/swallowing
- tingling/numbing
- memory and emotion
- sexual problems incl. erectile dysfunction and difficulty with ejaculation.

Due to this wide variety of symptoms, MS can be hard to diagnose as it can be mistaken for many other diseases and the same symptoms are not experienced by everyone. There are, however, some tests which can be performed: MRI scans can detect areas of inflammation and scarring on the myelin, physical, balance, motor and visual tests can assess motor function, and testing blood or spinal fluid looking for abnormal composition and vitamin deficiency.

Treatments: Currently there is no cure for MS, however, there are treatments for some of its symptoms. These include steroid regimes which can slow its progression, physiotherapy to aid muscle movement and spasticity and immunosupprisve drugs such as Glatiramer acetate. It is thought that exercise and healthy diet can also help.

References

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