

Abstract in English

Multiple sclerosis (MS) is an incurable, chronic, and unpredictable demyelinating disease that affects the central nervous system of the brain or the spinal cord. It leads to a broad range of symptoms of which fatigue is the worst and the most frequent problem reported by the patients. Fatigue may have complex causations. It may be primary related to the disease mechanisms in the central nervous system, such as demyelination, axonal loss, or inflammation, which is categorized as primary fatigue. It may also be secondary caused by other none specific disease-related factors, such as sleep disorder, severe pain, use of medication, and psychological factors, which are described as secondary fatigue. Frequently, it is very difficult for individuals to distinguish whether it is primary or secondary fatigue; and it could also be both.

Many efforts have been made to explain fatigue from different pathophysiological mechanisms. It has been found that some defined anatomical brain areas have associations with MS fatigue, but the causation of this complex symptom is still not completely explained.

The purpose of this study is to explain fatigue from another perspective under the hypothesis that the performance of physiological parameters on patients with fatigue during cognitive and physical tasks; and over day and night, are different from healthy people. If it is accepted, a secondary hypothesis suggests that by continuously measuring and monitoring a set of physiological and functional parameters, new mechanisms related to fatigue, or new secondary contributors to fatigue can be provided.

A portable, wireless body sensor measurement system, named FAMOS, has been developed, which can continuously measure electrocardiogram signal, body skin temperature, electromyogram signal, and motions of feet. Besides, a pulse oximeter and a blood pressure monitor are employed for measuring oxygen saturation and blood pressure, respectively.

27 participants including 17 MS patients with fatigue, 1 patient without fatigue, and 9 sex- and age-matched healthy controls are involved in the study. The monitoring process is over day and night, and contains a number of physical and mental tests.

The result shows that several physiological and functional parameters of the MS patients with fatigue are significantly different from the healthy controls. These evidences indicate that when fatigued MS patients are exposed to different tasks of both mental and physical character, MS patients have a different autonomic response compared to healthy controls. Further studies are needed to distinguish the extent of how much these responses are explained by fatigue and disease, respectively.

The FAMOS works continuously on acquiring data of multiple physiological and functional parameters. Compared to questionnaires, it provides a new and much more dynamic approach to the study of fatigue in MS and probably also in other disorders.