

Review article

Muscular, cardiac, ventilatory and metabolic dysfunction in patients with multiple sclerosis: Implications for screening, clinical care and endurance and resistance exercise therapy, a scoping review

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ABSTRACT

In the treatment of multiple sclerosis (MS), exercise training is now considered a cornerstone. However, most clinicians tend to focus on neurologic deficits only, and thus prefer to prescribe rehabilitation programs specifically to counteract these deficits. However, the present comprehensive review shows that patients with MS (pwMS) also experience significant muscular, cardiac, ventilatory and metabolic dysfunction, which significantly contribute, next to neurologic deficits, to exercise intolerance. In addition, these anomalies also might increase the risk for frequent hospitalization and morbidity and can reduce life expectancy. Unfortunately, the impact of exercise intervention on these anomalies in pwMS are mostly unknown. Therefore, it is suggested that pwMS should be screened systematically for muscular, cardiac, ventilatory and metabolic function during exercise testing. The detection of such anomalies should lead to adaptations and optimisation of exercise training prescription and clinical care/medical treatment of pwMS. In addition, future studies should focus on the impact of exercise intervention on muscular, cardiac, ventilatory and metabolic (dys)function in pwMS, to contribute to improved treatment and care.

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1. Introduction

Multiple Sclerosis (MS) is a neurodegenerative disease of the central nervous system that predominantly affects young to middle-aged adults. The pathology of MS is characterized by myelin, oligodendrocytes and axonal loss in the brain, brain stem and spinal cord and by white matter lesions [1], resulting in heterogeneous and complex neurological deficits, including spasticity, weakness, visual disturbances, walking and coordination impairments, tremor, ataxia, sensory problems and bladder disturbances [2]. Furthermore, “invisible” symptoms such as depression, fatigue and cognitive dysfunction are also common MS symptoms, which may occur early in the disease course [3–5]. A combination of these symptoms may eventually lead to an inactive or sedentary lifestyle [6,7], which may further exaggerate muscle weakness, fatigue, reduced functional capacity and associated health risks [8–10]. It therefore occurs very often that patients with MS (pwMS) experience impaired functional capacity and/or elevated health risks [11, 12] that cannot always be explained by the disease per se, but is probably related to altered physical activity levels.

In the treatment of MS it is nowadays commonly accepted that pwMS significantly benefit from rehabilitation/exercise therapy throughout the course of the disease. Rehabilitation is defined as “a problem solving educational process aimed at reducing disability and handicap experienced by someone as a result of disease or injury” [13]. In particular, the primary goal of clinicians in hospitals and MS rehabilitation centres is to improve the above mentioned neurological deficits, by reducing the limitations of activity and participation, to reach the highest possible level of independence, in order to maintain or even improve the quality of life of pwMS [14]. Given the heterogeneous symptoms of pwMS, a multidisciplinary approach is often warranted, including physiotherapy, occupational therapy, psychological and coping programs, cognitive rehabilitation, speech therapy and therapy to improve fatigue [15–25].

Next to the above mentioned neurological deficits, however, it has not been clearly established whether pwMS also experience MS-related muscular (at whole-muscle and cellular level), cardiac, ventilatory and metabolic dysfunction, despite the fact that these dysfunctions may contribute to the development of secondary health complications and/or internal diseases. It is commonly assumed that these dysfunctions in pwMS are

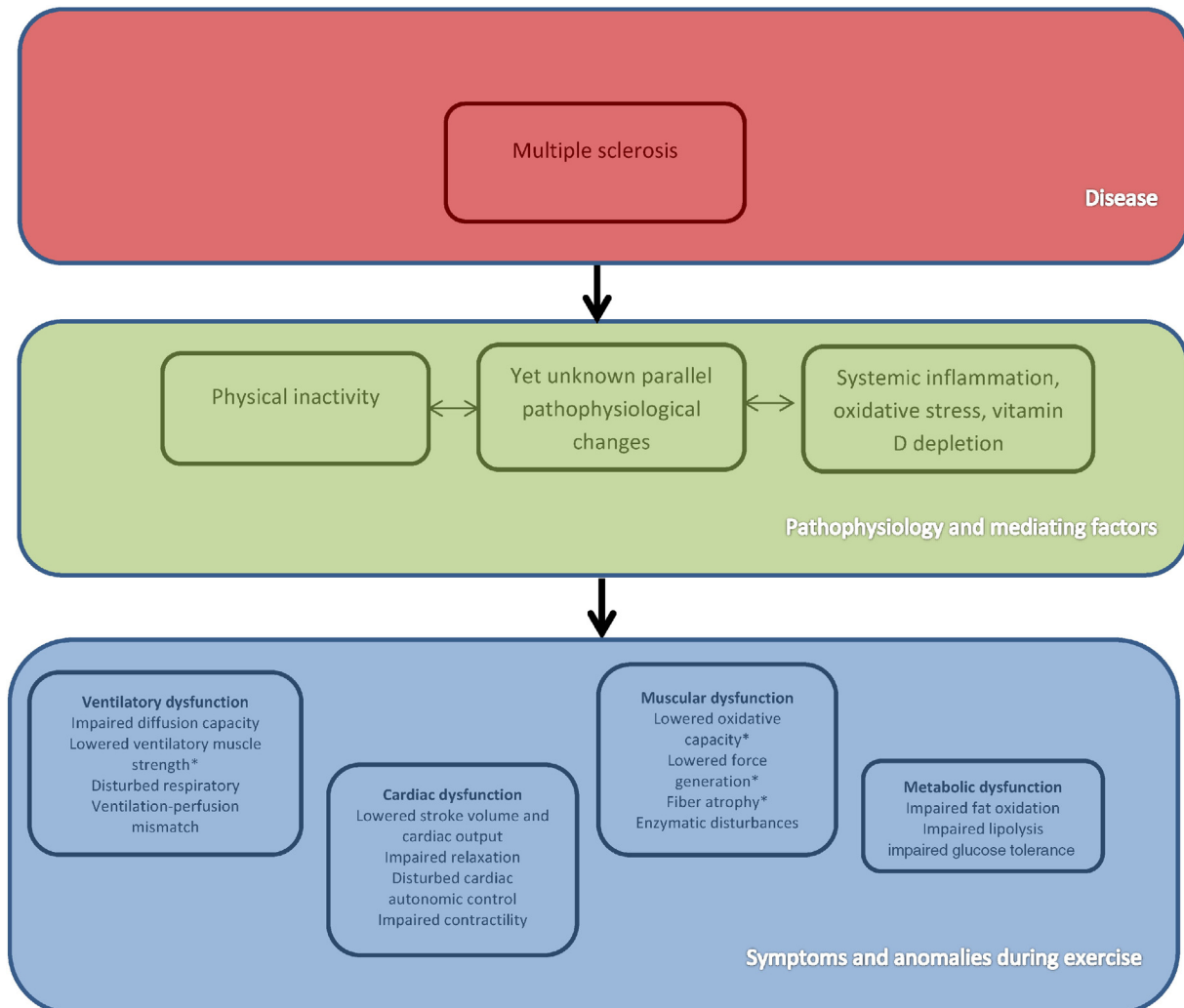


Fig. 1. Muscular, ventilatory, cardiac and metabolic function (during exercise) in pwMS. Outcomes highlighted by means of * may be remediated by exercise training intervention in pwMS.

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