

## **Beneficial Effects of Physical Sport Activity in Multiple Sclerosis Patients**

**Marco Masullo**

University Parthenope of Naples  
marco\_masullo@yahoo.it

**Domenico Tafuri**

University of Naples "Parthenope"  
domenico.tafuri@uniparthenope.it

### **Abstract**

Multiple sclerosis (MS) is the most common demyelinating disabling disease of the central nervous system in young adults. In the last years, a great amount of studies have been done in order to understand the possible beneficial effects of physical activity and sport in this disease.

In this paper a focus on the effects and safety of physical activity and sport in patients affected by MS has been done.

### **Keywords**

Multiple sclerosis, physical activity, sport, resistance training, aerobic training

## **Introduction**

Multiple Sclerosis (MS) is an inflammatory, demyelinating and degenerative disease of the Central Nervous System (CNS). Commonly it affects people between 20 and 40 years with a prevalence around 100 cases out of 100,000 in Europe where it represents one of the most frequent cause of disability in young adults.

### *Etiology*

There are many hypotheses on the causes of the disease: nowadays, most of the experts consider it a multifactorial pathology characterized by a mix of genetic and environmental factors. The first include sex, with a greater prevalence in woman, ethnicity, variations in histocompatibility complexes and single-nucleotide polymorphism of non-HLA genes; the latter refers to geography, in particular to sun exposure, and vitamin D levels.

### *Clinical manifestations*

MS is characterized by a greater heterogeneity of symptoms like spasticity, reduction of muscular strength, dysesthesia, paresthesia, diplopia, trigeminal neuralgia, ataxia, tremor, urinary incontinence and/or hesitation, erectile dysfunction and cognitive impairment. Nevertheless, the most frequent symptom is probably fatigue, defined as a lack of physical and/or mental energy that is perceived by the individual or the caregiver to interfere with usual activities.

### *Clinical course and diagnosis*

There are different clinical phenotypes of MS. In the 85% of the cases people develop Relapsing-Remitting MS (RRMS), characterized by phases of clinical activity and phases of remission. Some of them develop Secondary Progressive MS (SPMS) which led to a slow progression of symptoms and disability. In the 10% of the cases MS manifests as Primary Progressive MS (PPMS) which differs from SPMS only for not deriving from RRMS. Another clinical phenotype is Clinically Isolated Syndrome (CIS) which refers to a first clinical event highly suggestive of demyelinating CNS disease without respecting diagnostic criteria of MS.

Nowadays the diagnosis is based on McDonald diagnostic criteria, which the most recent revision was done in 2017.

### *Treatment*

There are two categories of MS treatment: acute attacks and disease modifying therapies (DMT). For acute attacks, in order to treat relapse, high dose of glucocorticoids are the mainly therapy. DMTs are different forms of immunomodulatory agents, administered via different route of administration, with the goal of reducing the amount of relapses and decrease disease progression.

## **MS and physical activity**

Previous advice for MS patients was to avoid every type of physical exercise in order to prevent injuries, disease progression and relapse. In the last years, experts and neurologists have been changed their point of view on this matter. On the basis of years of research in this field, physical activity is now considered one of the most important ways not only to preserve psychomotor functions in MS patients but also to reduce disease progression and improve life quality.

### *Safety of exercise training*

Physical activity is now considered safe for MS patients. A systematic review of 26 studies done by Pilutti *et al.* showed that exercise training don't improve rates of relapse and that, on the contrary, it could reduce the risk of developing it. Furthermore, this study showed also that there isn't difference in getting adverse effects between MS patients and general population.

Most of adverse effects are represented by musculoskeletal injuries. In line with this evidences, another systematic review done by van den Akker *et al.* proved that cardiopulmonary exercise testing (CPET), a global test of the cardiorespiratory capacity that reflects the entire oxygen transport system starting with the lungs and ending with the skeletal muscles, is also safe in MS patients related to their physical abilities.

#### *Exercise training in MS*

Resistance and endurance training constitutes the two extremes of basic physical exercise. The first is an exercise in which muscles contract against a resistance such as lifting weights or using exercise band with the aim, in most cases, of increasing muscular strength, function and size. Resistance training can be beneficial in MS patients. In fact, it can improve muscular strength, muscle fibers size and balance. These findings could also be associated with the improvement of functional capacity, for example in stair climbing and gait. Furthermore, Kjølhed *et al.* showed that a 24 weeks of progressive resistance training, a program in which the resistance of the exercise progressively increase during the various training days, could have a neuroprotective and neuroregenerative effect on MS.

Endurance training generally refers to aerobic exercise, a physical exercise of moderate intensity that depends on the aerobic energy-generating process with the aim of improving cardiovascular fitness. Most common examples of aerobic sport exercises are running, cycling, walking and swimming. One of the main effects of aerobic exercise in MS patients could be the reduction of fatigue. Furthermore, as resistance training, aerobic exercises could improve balance in MS patients.

There are discordant results on the effects of exercise training on depression in MS patients. In fact, a critical review and meta-analysis done by Dalgas *et al.* shows that exercise can be a potential treatment to prevent or improve depressive symptoms in MS patients despite the existing studies does not allow for solid conclusions.

Less information are now available on combined training which, unless its safeness, needs more assessments in clinical trials.

#### *Unconventional sport training*

Tai Chi is a Chinese martial art system involving balance, strength, speed, coordination and flexibility, evolved nowadays into a multiple-element form of exercise including gracefulness, mindfulness, softness, and gentleness. Different studies showed that Tai Chi could have beneficial effects in elderly and chronic diseases like Parkinson's disease. In the last few years possible positive effects have been highlighted also in MS. In fact, a systematic review of ten studies, including two randomized controlled design studies, done by Zou *et al.* showed potential effectiveness in MS patients. In particular, despite of methodological flaws like small sample sizes and unclear description of training protocols, Tai Chi seems to improve life quality and functional balance, whereas it is still unclear if it can be useful for depression symptoms, pain and fatigue.

Yoga, inherent in the traditional Indian spiritual practice, is a complex intervention that includes not only physical activity but also advice for ethical lifestyle. In western countries, in addition to its traditional conception, yoga is often associated with physical postures, breathing techniques and meditation. As for Tai Chi, different studies showed that yoga could be useful for different diseases, in particular for neuropsychiatric disorders. Recently, different studies highlighted the possible beneficial effects of yoga in MS patients. For example, a systematic review and meta-analysis of nine studies done by Cramer *et al.* showed a positive effect on fatigue and mood in MS patients.

### **Conclusions**

MS is a heterogeneous disease in which it is not always possible to control its symptoms and progression with pharmacotherapy. Under this scenario physical activity and sport can play

a fundamental role in the global management of MS patients and represent a fundamental part in the treatment of the disease. It is important to consider that nowadays physical sport activity is considered safe for MS when it is tailored on the physical ability of the patient. Furthermore, different kind of exercises training can be taken in consideration, each of them with different possible beneficial effect.

In conclusion, it could be very important to introduce in daily clinical practice the prescription of physical activity tailored on physical capacity and preferences of MS patients.

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