



ORIGINAL CLINICAL RESEARCH

# Yoga therapy and ambulatory multiple sclerosis Assessment of gait analysis parameters, fatigue and balance



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## KEYWORDS

Multiple sclerosis;  
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**Summary** *Background and Objective:* Gait impairment, falls due to balance problems and fatigue are among the most important complaints in patients with multiple sclerosis (MS) and cause significant functional limitation. Use of complementary and alternative medicine (CAM) to help symptom management and to improve quality of life is growing among MS patients. Yoga is widely used as one of these CAM interventions, however, the number of studies that show the efficacy of yoga training in MS is inadequate. In this study, we aimed to evaluate the effects of a short term yoga program on fatigue, balance and gait in patients with MS.

*Method:* Eight volunteer ambulatory MS patients with clinically definite relapsing remitting MS whose Expanded Disability Status Score (EDSS) is less than or equal to 6.0, and eight healthy subjects were included in the study. Patients participated in 12 weeks of a bi-weekly yoga program under supervision. At their baseline and after yoga therapy, the Fatigue Severity Scale (FSS) and Berg Balance Scale (BBS) are used to assess fatigue and balance. Three dimensional gait analysis is done using the Vicon 612 system with six cameras and two Bertec force plates, before and after therapy.

*Results:* After short term yoga therapy, statistically significant achievements were obtained in fatigue, balance, step length and walking speed. Although sagittal plane pelvis and hip angles, ankle plantar flexor moment, powers generated at the hip and ankle joints at the pre-swing were improved, the improvements were not statistically significant.

*Conclusion:* Yoga therapy is a safe and beneficial intervention for improving fatigue, balance and spatiotemporal gait parameters in patients with MS. Further studies with a larger sample size and longer follow-up will be needed to evaluate the long term effects of yoga therapy.

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## Introduction

Fatigue, balance and gait disturbances are among the most common problems in patients with multiple sclerosis (MS) which cause important personal, social and economic burdens, such as difficulties in the activities of daily living, reduced productivity, unemployment and reduced quality of life (Chandraratna, 2010; Heesen et al., 2008; Paltamaa et al., 2007). Seventy-five to ninety percent of patients with MS report fatigue and 55% describe it as one of their worst symptoms, and 85% of patients report gait disturbance as their main complaint (Flachenecker et al., 2002; Fisk et al., 1994; Lerdal et al., 2007; Scheinberg et al., 1980). Within 15 years of the onset of MS, almost half of patients require walking assistance and 10% become wheelchair dependent (Weinshenker et al., 1989). Since currently there is no cure with pharmacological treatment, and drug therapy has a limited effect on the disability, symptomatic and supportive therapies are important (Bourdette et al., 2004; Riley et al., 2004).

There is a progressive trend towards the use of yoga as a mind-body complementary and alternative medicine intervention, adjunct to medical treatment by MS patients (Esmonde et al., 2008; Oken et al., 2004; Winterholter et al., 1997). Although it is popular and reported as highly satisfactory by patients with MS, there are few yoga studies in MS using objective quantitative outcome measures.

Exercise is extremely important for individuals with MS. Although findings are heterogeneous, many studies support the beneficial effects of different types of exercise, i.e. endurance and resistance training, combined programs, and aquatic exercises, on strength, endurance, fatigue, balance, walking, mood, and health-related quality of life in patients with MS (Andreasen et al., 2011; Dalgas et al., 2009; Garrett et al., 2009, 2013; Oken et al., 2004; Petajan et al., 1996; Sutherland et al., 2001).

Since MS is characterized by various neurologic deficits, an optimal exercise modality does not exist. The benefits of yoga postures (asanas), working with the breath (pranayama) and meditation may include increased body awareness, release of muscular tension, increased coordination and balance, increased flexibility and strength, control over fatigue, improved circulation and breathing. Yoga focuses on improving a person's physical, mental and spiritual well-being. The main aim of yoga is to harmonize the body, mind and spirit through a combination of poses, meditation and breathing exercises. Unifying body, mind and spirit allows one to achieve a sense of wholeness, peace and self-realization. Yoga poses are constructed in a way that works towards a common goal, such as battling fatigue, reducing spasticity, improving cognitive function and increasing range of motion (Fishman et al., 2007; Velikonja et al., 2010).

The purpose of this study was to determine the effects of 12 weeks of short term yoga therapy on fatigue, balance and gait parameters in people with multiple sclerosis (MS).

## Methods

After getting informed consent, eight volunteer ambulatory patients with multiple sclerosis (MS), with clinically definite relapsing remitting MS (which presents with fluctuations of

symptoms and mild disability), and whose Expanded Disability Status Score (EDSS) was less than or equal to 6.0, and eight age, gender and body mass index similar healthy subjects were included in the study. Three patients were on Interferon beta 1a; two on Glatiramer acetate; one on Tizanidine, and one on Escitalopram. Exclusion criteria were: being non-ambulatory, use of pharmacological agents to control fatigue (including major sleep disorder, clinical depression, anemia, hypothyroidism and B12 deficiency), significant balance problems (including cerebral vascular accident and peripheral neuropathy), peripheral vestibular disorders (Meniere's disease, benign positional paroxysmal vertigo, acoustic neuroma, unilateral/bilateral vestibular hypofunction), or had undergone steroid therapy within the last 4 weeks. Eight healthy subjects were assessed in gait analysis who had not taken yoga classes.

Patients with MS participated in 12 weeks of bi-weekly yoga class under supervision at the University Hospital in the Yoga unit. The Yoga unit is nearly 20 square meters and 16–17 centigrade degrees. All poses (Table 1 and Fig. 1) were performed over the course of 60 min and were supported, either with a chair or by having the subject on the floor or against the wall. Where needed, poses were modified according to the capabilities of the individual patients. Specific adaptations of yoga postures for people with limited mobility due to neurological conditions such as multiple sclerosis and stroke have been described before (Eudora et al., 1990). Each pose was held for approximately 10–30 s, followed by a resting period lasting from 30 s to 1 min. Each class ended up with a 10-min deep relaxation period with the subjects lying supine (Savasana pose). Progressive relaxation and meditation techniques were introduced during this time. All patients' took the same classes because our mind is psychologically supported by group sessions. Daily home practice was strongly encouraged, so that they could become able to do some poses without help. We were to assess the effects of yoga therapy in patients after 12 weeks yoga programs.

## Fatigue and balance assessments

Fatigue and balance of the patients with MS were assessed using the Fatigue Severity Scale (FSS) and Berg Balance Scale (BBS), respectively, at their baseline and after yoga therapy (Berg et al., 1992; Krupp et al., 1989). The reliability and validity of the Turkish version of both scales have been shown before (Armutlu et al., 2007; Sahin et al., 2008).

The FSS, which was published in 1989 by Krupp, has nine items. For each question, the patient is asked to choose a number from 1 to 7 that indicates how much the patient agrees with each statement, where 1 indicates strong disagreement and 7 indicates strong agreement. A score of 4 or higher generally indicates severe fatigue. Flachenecker et al. reported a significant correlation between EDSS and FSS (Flachenecker et al., 2002).

The BBS is a clinical scale that evaluates balance in sitting and standing and rates performance from 0 (cannot perform) to 4 (normal performance). The scale has fifteen items that explore the ability to sit, stand, lean, turn and maintain the upright position on one leg. The BBS has been

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