

# Neuromuscular taping in multiple sclerosis. A pilot study

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**Abstract.** *Background and aim of the work:* Neuromuscular Taping (NT) is a relatively new device that induces micro-movements by stimulating receptors in the skin. The aim of this study was to analyze the effect of the application of Neuromuscular Taping (NT) on motor performance and quality of life in a cohort of multiple sclerosis (MS) patients. *Methods:* Twenty MS patients with Expanded Disability Status Scale  $\leq 4$  (EDSS); clinically stable disease; absence of relapses during the last 3 months; absence of rehabilitation treatment or symptomatic drugs acting on muscular tone or fatigue for at least 2 months; a stable disease modifying treatment for at least 3 months; were treated with the application of NT. It was applied four times at 4-day intervals on the weakest side of the hamstrings muscles. The treatment efficacy on motor performance was evaluated by the six minute walking test (6MWT), measured at the beginning of treatment (T0), at the end of NT application (T1), and three weeks after the last treatment application (T2). Moreover, Short Form 36 health survey (SF-36) was administered to evaluate the quality of life. *Results:* The mean distance covered during the 6MWT improved significantly between T0 and the successive T1 and T2 measurements, passing from  $342.6 \pm 148.9$  mt at T0 to  $395.8 \pm 146.0$  mt at T2 ( $p=0.03$ ). The SF-36 showed a statistically significant improvement in most items. *Conclusions:* The application of NT was able to improve significantly the motor performance and the quality of life in our small case series of MS patients. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** multiple sclerosis, neuromuscular taping, quality of life

## Introduction

Multiple sclerosis (MS) is the leading cause of neurological disability in young adults. Locomotor disability in MS patients derives from several mechanisms of functional impairment (coordination of posture and gait, energy cost, cognitive involvement and impaired execution of automatic tasks) (1). Furthermore, walking performance can be seriously compromised by fatigue, an etiologically multifactorial symptom (2, 3) that reduces physical activity, on its turn increasing disability (4, 5).

Rehabilitation is often the only treatment available to relieve functional symptoms, though its effectiveness in MS is still a matter of debate (6). Most of the rehabilitation studies published so far in the field

of MS have focused on the effects of physiotherapy and several studies have shown a positive effect of exercise on muscle-power (7-13).

Neuromuscular Taping (NT) is a relatively new device, used in rehabilitation programs in orthopedic and sports settings (14), increasingly becoming an adjunctive treatment option for multidisciplinary rehabilitation in MS patients (15). It is a thin and elastic tape which can be stretched up to 120-140% of its original length. Therefore it is quite elastic and results in less mechanism constraints, compared with conventional tape (16). This technique normalizes muscular function, increases lymphatic and vascular flow, reduces pain, strengthens weakened muscles, and assists the postural alignment relaxing the overused muscles (17). It has been claimed that the effects of

NT may be due to the sensorimotor and proprioceptive feedback mechanisms (18-21). NT provides a fast sensorimotor feedback: patients often report symptom relief, improved comfort level, or stability of the involved joint in a few days.

NT may be an alternative rehabilitation option in the treatment of MS when a quick effect is needed (22). However, more research, both clinical and neurophysiological, is needed to clarify the mechanisms of action and the effects of the NT technique (17). In this study, we have analyzed the effect of NT on motor performance in a cohort of MS patients.

## Material and methods

Patients with MS referred to our rehabilitation unit were enrolled in the study if they fulfilled the following inclusion criteria:

- A diagnosis of MS according to Polman criteria (23);
- Disability, assessed using the Expanded Disability Status Scale (EDSS), of mild-to-moderate degree ( $EDSS \leq 4$ ) (24);
- A clinically stable disease (no variation in the EDSS score during last year);
- Absence of relapses during the last 3 months;
- Absence of rehabilitation treatment or symptomatic drugs acting on muscular tone or fatigue for at least 2 months;
- A stable disease modifying treatment for at least 3 months.

All the patients were treated four times with NT, at 4-day intervals, on the weakest side of the hamstrings muscles. The NT applied was 20 cm long and subdivided in 5 fan-like fringes. It was applied in a manner to create stand up folds (Fig. 1). At baseline (T0) each patient was evaluated with the following tests:

- Six-minute walk test (6MWT): the patients were asked to walk for 6 minutes at their highest speed in order to cover the maximum distance possible (25, 26).
- Short Form 36 Health Survey (SF-36): this questionnaire is widely used to evaluate quality of life (QL), with eight scales: physical functioning, role

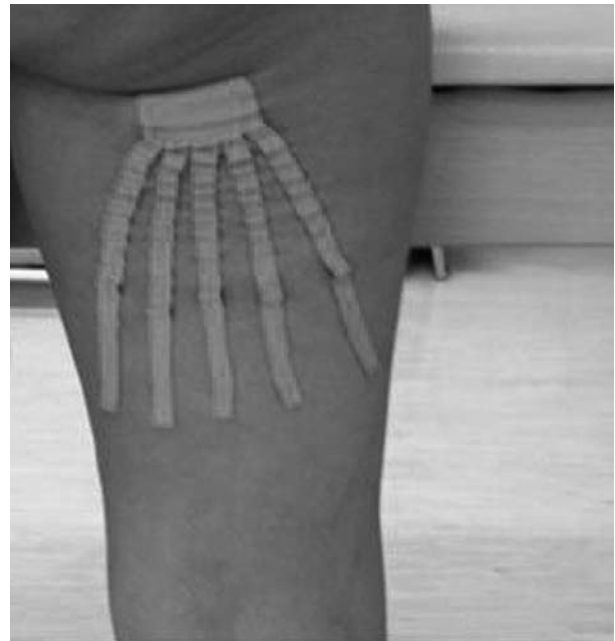


Figure 1.

physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. The scales range from 0 (worst condition) up to 100 (best condition). Scores on the SF-36, by each of its domains and summary subscales, are expressed in standardized metrics (0 to 100) and in typified scores for the Italian reference population (27). 6MWT was repeated at the end of NT application (T1), and 3 weeks after the end of the treatment (T2). At T1 and T2, SF-36 was also performed. Each patient was informed of the purpose and the procedures of the study and gave his/her informed consent prior to participation. The study was approved by the local ethics committee. The statistical package SPSS 17.0 was used for descriptive and inferential analysis. Since the data showed a non-normal distribution, non-parametric tests were used: Wilcoxon signed rank test for SMWT and SF-36 data.

## Results

Twenty MS patients, between 31 and 54 years of age (mean:  $45.5 \pm 6.54$  years), with mean EDSS of  $3.4 \pm 1.26$ , all of them affected by a relapsing-remitting

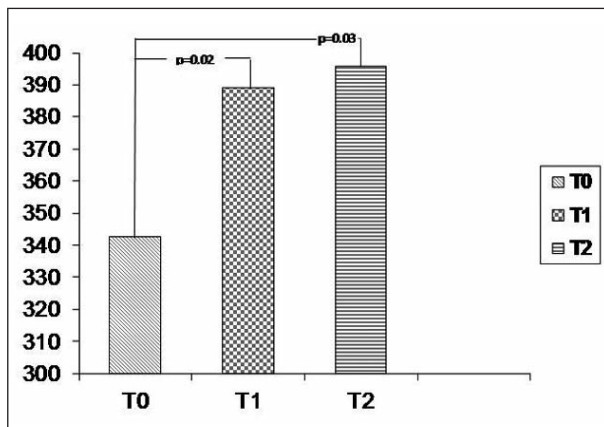


Figure 2.

form of the disease, entered the study. Nineteen patients completed the study, while one patient withdrew after the third application of NT due to an ankle sprain.

The SMWT demonstrated a statistically significant improvement between the baseline and the subsequent assessments. A significant change was already evident at the end of last application (T1), and was maintained without variations through T2.

The mean distance covered passed from  $342.6 \pm 148.93$  mt at T0 to  $389 \pm 142.51$  at T1 ( $p=0.02$ ) to  $395.8 \pm 146$  mt at T2 ( $p = 0.03$ ) (Fig. 2), with a 15.5% mean gain. Seven out of 19 patients (36.8%) increased the distance covered more than 20%.

SF-36 showed a statistically significant improvement between T0 and the subsequent evaluations in most scales, concerning both the physical and the mental health (Table 1).

## Discussion

The application of NT to our population of relapsing-remitting moderately disabled MS patients gave encouraging results, significantly enhancing walking performance, that improved at a level considered clinically meaningful (>20%) (28), in a percentage of patients (36.8%) similar to that recently achieved with the expensive drug fampridine (29). Another proof that the improvement of walking performance was meaningful for the patient was the concurrent improvement of quality of life, both in the physical and mental items. This is not surprising considering that gait was rated at first rank, together with visual function, among bodily functions by MS patients (30). In the light of our results, we believe that the effects induced by the NT application may provide a postural imbalance and a positive influence on motor performance and quality of life as demonstrated by the sustained increase of the distance traveled at the 6MWT and SF-36. The literature regarding NT as a therapeutic application is quite scanty. It has been shown, using EMG, that NT applied to a muscle group results in stronger muscle activation (22) It has been hypothesized that the application of NT is able to stimulate cutaneous mechanoreceptors. These receptors activate nerve impulses when mechanical loads (touch, pressure, vibration, stretch and itch) create deformation. Their activation by an adequate stimulus causes local depolarization, that triggers nerve impulse along the afferent fiber travelling toward the central nervous system. The application of NT may apply pressure to the skin or stretch the skin.

This external load may stimulate cutaneous mechanoreceptors, causing physiological changes in the

Table 1.

SF-36 Items	T0	T1	T2	P T1 vs T0	pT2 vs T0
Physical functioning	58.16	64.74	67.11	0.009	0.001
Physical role	44.74	69.74	59.21	0.01	ns
Bodily pain	48.05	65.84	69.68	0.01	0.01
General health	56.63	49.84	54.00	ns	ns
Vitality	49.21	56.84	57.89	0.009	0.02
Social functioning	65.74	77.47	77.37	0.001	0.02
Emotional role	62.89	74.53	68.16	ns	ns
Mental health	58.95	71.89	71.37	0.001	0.006

taped area. Studies previously conducted to determine the effects of NT on cutaneous mechanoreceptors have reported that its application may improve the excitability of selected muscles and joints. Although research on neuromuscular taping is limited, several studies have supported the efficacy of this treatment technique for addressing acute injury inflammation, promoting a faster return to activity, enhancing proprioception training, reducing pain, enhancing postinjury neurological function, and reducing muscle imbalances (18-21).

Our study presents several limitations. It was carried out on a small sample in an open way. Patients could have expected a positive effect from using NT or anticipated the researchers expectation toward the NT effects. The tape was used on a group of MS patients with mild-to-moderate disability and therefore the results are not generalizable to all the MS patients. Our encouraging results should be confirmed by randomized clinical trials carried out in larger samples for longer periods. An extended follow-up period is needed in order to evaluate the duration of the proprioceptive effect, which might perhaps be revived with periodic therapeutic applications of NT.

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