

Walking related motor fatigability in a cohort of early non-disabled multiple sclerosis patients: potential role as a prognostic biomarker

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INTRODUCTION

Walking related motor fatigability has been described in people with multiple sclerosis (pwMS), particularly at higher disability levels. A potential prognostic role has been hypothesized. However, its prevalence and prognostic role in early, non-disabled pwMS have not yet been clearly defined.

AIM

To evaluate walking fatigability and its relationship with short term disease progression in early, non-disabled relapsing pwMS.

METHOD

-Study design: observational prospective monocentric study.

-Patients: relapsing remitting pwMS, aged 18-65 years, Expanded Disability Status Scale (EDSS) score ≤ 2.0 , disease duration ≤ 3 years, no steroid treatment within 30 days, no clinical relapses within 3 months from gait analysis, without concomitant diseases interfering with balance and gait. A control group (HCs) was enrolled too.

-Procedures: At baseline pwMS and HCs performed a 6-minute walking test (6MWT) and the ratio between distance walked during the last compared to the first minute (distance walking index [DWI6-1]) was calculated. Distance walking fatigability (DWF) was defined as DWI6-1 $\leq 10\%$.

-Outcomes: 6MWT performances were compared between pwMS and HCs. The association between DWI6-1 at baseline and 2-year No Evidence of Disease Activity (NEDA-3) status was evaluated through multivariable logistic regression analysis adjusting for age, sex, EDSS at baseline, level of disease modifying treatment efficacy, relapses in the year before baseline.

RESULTS

Tab 1. Demographic and clinical features of pwMS and HCs

	pwMS (n=89)	HCs (n=36)	p
Age, y, mean \pm SD	37.6 \pm 11.2	30.8 \pm 8.8	0.001
Sex (F), n(%)	65 (73)	21 (58)	0.108
BMI, kg/m ² , mean \pm SD	23.4 \pm 4.2	23.2 \pm 4.1	0.907
EDSS, mean \pm SD	1.3 \pm 0.5	/	/
Disease duration, y, mean \pm SD	1.9 \pm 1.0	/	/

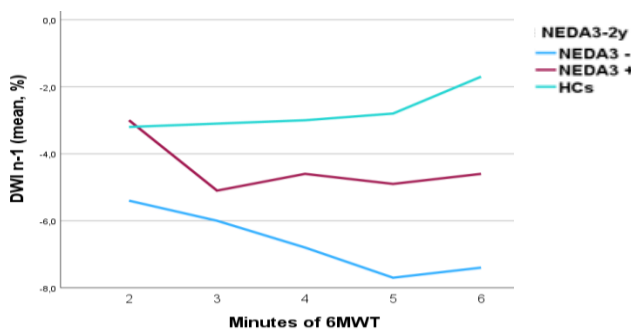
Tab 2. Spatiotemporal gait parameters of whole samples

	pwMS (n=89)	HCs (n=36)	p
Distance walked, m, mean \pm SD	610.8 \pm 78.2	635.8 \pm 66.4	0.107
Step length, cm, mean \pm SD	81.3 \pm 8	84 \pm 6.3	0.087
Cadence, n/min, mean \pm SD	130.9 \pm 9.1	130.8 \pm 8.5	0.934
Velocity, m/s, mean \pm SD	1.78 \pm 0.22	1.83 \pm 0.19	0.282
DWI 6-1, %, mean \pm SD	-5.7 \pm 5.7	-1.7 \pm 6.5	0.001

Tab 3. Comparison between DWF+ and DWF- pwMS

	DWF - (n=75)	DWF + (n=14)	p
Age, y, mean \pm SD	37.6 \pm 11.1	37.9 \pm 12.4	0.919
Sex (F), n(%)	56 (74.7)	9 (64.3)	0.422
BMI, kg/m ² , mean \pm SD	23.3 \pm 3.8	23.8 \pm 6	0.671
EDSS, mean \pm SD	1.3 \pm 0.6	1.3 \pm 0.6	0.826
Disease duration, y, mean \pm SD	1.88 \pm 1.01	1.83 \pm 1.27	0.884
SDMT, mean \pm SD	59.3 \pm 11.1	53 \pm 15.3	0.084

Fig 1. DWI n-1 in pwMS with/without 2y-NEDA3 and HCs



Tab 4. Chi-square comparison of DWF between pwMS with/without 2Y-NEDA3 and HCs

DWF	NEDA3 + (n=42)	NEDA3 - (n=25)	HCs (n=36)
DWF -	40	17	34
DWF +	2	8	2
	4.8%	32%	6.1%

	χ^2	p
Chi Square Test	12,66	0,002

Tab 5. Multivariable regression analysis: predictors of 2 year NEDA 3 status; n=67

	OR	95%CI	p
Sesso (F)	0,29	0.07-1.20	0.087
Età	0.99	0.94-1.04	0.646
Baseline EDSS	1.48	0.48-4.60	0.499
Relapses in the year before baseline	0.47	0.14-1.54	0.210
DMT efficacy level (HE)	1.48	0.48-4.60	0.499
DWI 6-1	1.12	1.01-1.24	0.004

CONCLUSIONS

Walking related motor fatigability was found in approximately 16% of non-disabled relapsing pwMS and could be helpful as an early prognostic marker.

The DWI6-1 could be useful in clinical practice and to develop targeted rehabilitation strategies.

DISCLOSURES

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