

The impact of cognitive function on motor performance and dual-task ability in early non-disabled multiple sclerosis patients

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INTRODUCTION

Gait and cognitive impairments are common in patients with multiple sclerosis (pwMS).

Cognitive-motor interference becomes evident during simultaneous cognitive and motor tasks, particularly in pwMS with reduced attentional resources, who tend to adopt a "posture second" strategy, prioritizing cognitive tasks at the expense of motor control.

OBJECTIVE

To evaluate the influence of cognitive function on motor performance during single and dual-task conditions in a cohort of early, non-disabled relapsing pwMS.

METHODS



Monocentric observational study. Relapsing pwMS aged 18-65 years, EDSS ≤ 2 , disease duration ≤ 3 years



Spatiotemporal gait parameters were measured during three conditions: a 1-minute walk at preferred speed (single task-ST), while performing a cognitive task (alternating alphabet letters) (dual task-DT) and a 6-minute walking test (6MWT) at their fastest speed. Dual-task costs (DTCs) were calculated as the % change in gait parameters between DT and ST.



Cognitive function was assessed through a Brief Repeatable Battery (BRB) and pwMS were categorized in normal-high cognitive functioning (NHCF) if they performed ≤ 1 test $z < -1$ and low cognitive function (LCF) when pwMS performed ≥ 2 tests $z < -1$ based on our normative data.

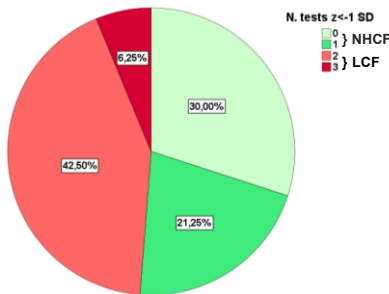
RESULTS

Motor performances were compared in ST, DT and 6MWT, and DTCs between the two groups through Student T or non-parametric tests, as needed.

Tab 1. Demographic and clinical features of pwMS cohort

	pwMS (n=80)
Age, y, mean \pm SD	37.5 \pm 11.2
Sex (F), n(%)	59 (73.8)
EDSS, mean \pm SD	1.3 \pm 0.5
Disease duration, y, mean \pm SD	1.9 \pm 1.1
BMI, mean \pm SD	23.4 \pm 4.2

Fig 1. Cognitive performance on BRB in pwMS cohort



Tab 2. Comparison between NHCF and LCF pwMS

	NHCF (n=41)	LCF (n=39)	p
Age, y, mean \pm SD	35.2 \pm 9.3	40 \pm 12.5	0.052
Sex (F), n(%)	29(70.7)	30(76.9)	0.912
EDSS, mean \pm SD	1.4 \pm 0.6	1.4 \pm 0.6	0.529
Disease duration, y, mean \pm SD	1.8 \pm 1.2	2 \pm 0.9	0.455
BMI, mean \pm SD	23 \pm 3.8	23.8 \pm 4.6	0.360
SDMT, mean \pm SD	65.8 \pm 9.9	50.6 \pm 9.2	<0.001
BDI-II, mean \pm SD	9.4 \pm 6.9	10.4 \pm 9.2	0.575
MFIS, mean \pm SD	26.6 \pm 15.5	26.3 \pm 17.2	0.935
Years of schooling, mean \pm SD	14.5 \pm 2.9	14.9 \pm 3	0.527
N. drugs, mean \pm SD	1.5 \pm 0.9	2.1 \pm 1.7	0.071
N. comorbidities, mean \pm SD	0.3 \pm 0.6	0.6 \pm 0.9	0.045

Tab 3. Comparison of ST performances between NHCF and LCF pwMS

	NHCF (n=41)	LCF (n=39)	p
ST, correct letters, mean \pm SD	36.8 \pm 7.1	31.4 \pm 9.5	0.005
ST, m walked, mean \pm SD	84.8 \pm 11.7	77.9 \pm 9.9	0.006
6MWT, m walked, mean \pm SD	635.2 \pm 78.3	586 \pm 77.6	0.006

Tab 4. Comparison of DT performances between NHCF and LCF pwMS

	NHCF (n=41)	LCF (n=39)	p
DT, correct letters, mean \pm SD	37.9 \pm 7.3	32.2 \pm 10.9	0.007
DTC cognitive task, %, mean \pm SD	-1.1 \pm 7.6	-1.3 \pm 11.5	0.910
DT, m walked, mean \pm SD	78.3 \pm 14.6	68.8 \pm 10.2	0.001
DTC of stride, %, mean \pm SD	3.1 \pm 5.1	5.9 \pm 6.1	0.030

CONCLUSIONS

Early-stage pwMS with lower cognitive functioning exhibit greater deterioration in motor performance under dual-task conditions. These results highlight the importance of cognitive function as a factor influencing gait performance, even in early, non-disabled MS patients and support its inclusion in rehabilitation strategies to improve long-term outcomes.

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References:
1 Wallin A et al. Cognitive-motor interference in people with mild to moderate multiple sclerosis, in comparison with healthy controls. *Mult Scler Relat Disord.* 2022;67:104181.
2 Hsu WY, et al. Cognitive function influences cognitive-motor interference during dual task walking in multiple sclerosis. *Mult Scler Relat Disord.* 2024;85:105516.