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## BACKGROUND

Upper limb motor dysfunction is very common in multiple sclerosis (MS), interfering with daily living activities and worsening quality of life [1]. Neuro-rehabilitation may be a particularly useful approach, since treatment options are limited. It has been previously demonstrated [2] that active task-oriented upper limb motor rehabilitation treatment in relapsing remitting (RR) MS has an impact both on motor performance and on MRI-derived metrics of white matter integrity compared to passive exercises. However, there is no evidence about the utility of this treatment in patients with progressive MS.

## AIMS

The aim of our study is to evaluate the clinical response and the MRI-derived metrics to task-specific oriented rehabilitation strategy in progressive MS patients. Here we report the study design and baseline demographic, clinical and radiological characteristics of patients enrolled in the study.

# MATERIALS AND METHODS

### Experimental design

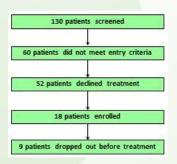
Inclusion criteria age: 18-65 years; b) EDSS ≤ 6.5 a)

Exclusion criteria:

- mini-mental state examination (MMSE) ≤ 26 a)
- modified Ashworth scale > 3 in at least 2 muscle groups history of cardiovascular, respiratory, orthopedic, psychiatric b
- c) conditions precluding participation
- d) MRI contraindications

Patients will receive 36 one-hour treatment sessions, three times a week for 2 months.

- Clinical and behavioral data will be recorded at baseline and will be collected after the rehabilitation treatment (T1) and at 12 month follow-up (T2).
- Distal and proximal upper limb motor performance, dexterity and perceived motor performance will be evaluated in all patients by the following standard measures:
- action research arm test (ARAT) nine Hole Peg Test (9- HPT) ABILHAND a)
- b)
- c) d) Arm function in multiple sclerosis questionnaire (AMSQ)
- At the same time points (baseline, T1 and T2), all subjects will undergo brain MRI (1.5 T GE) with the following protocol:
- axial DP-T2-4 mm; a)
- b)
- c) d)
- 3D-T1- weighted SPGR (voxel size 1 mm<sup>3</sup>) DTI with diffusion gradients applied along 61 directions T2\*-weighted EPI for resting state (rs)-fMRI with closed eyes



#### MRI Analysis

As gold-standard, lesion masks were manually outlined on T2-DP and 3DT1-images using the software package Jim (v 7.0). Normalized brain volume (NBV), Grey (GM) and White Matter (WM) volumes were obtained with Sienax [3].

#### Statistical analysis

All statistical analysis were performed using SPSS (v. 21.0)

# RESULTS

DEMOGRAPHIC CHARACTERISTICS	
Mean age, y	55 ± 12
F/M	8/1
Median EDSS (range)	4.5 (4-7.5)
Mean disease duration, y	22 ± 12
PPMS / SPMS	1/8
MRI CHARACTERISTICS (mean	n ± SD)
T2 lesion volume, mL	40 ± 25
T1 lesion volume, mL	29 ± 20
Normalized brain volume, mL	1189 ± 115
Normalized white matter volume, mL	566 ± 62
Normalized grey volume, mL	623 ± 73
FUNCTIONAL CHARACTERISTICS	mean ± SD)
Symbol digit modalities test (SDMT)	35 (11)
Right Nine-hole-peg-test (9-HPT)	42 (52)
Left Nine-hole-peg-test (9-HPT)	40 (29)
ABILHAND	38 (12)
AMSQ	49 (19)

- · 6 patients were assigned to the task-oriented rehabilitation treatment, 2 patients to the passive rehabilitation group and 1 patient was included in the control group
- Only 5 patients reached T1 time-point

## **DISCUSSION AND CONCLUSIONS**

- Enrollment of Progressive MS patients showed to be extremely difficult
- · Main resons for declining the rehabilitative treatment were: problems in reaching the rehab-center; comorbidities; mistrust in motor improvement
- · Main resons for drop-out were: job committment and demanding study design
- We have addressed the enrollment issues adopting the following strategies:
  - · reducing the treatment period from 3 to 2 months
  - · offering home treatment when preferred by the patients
  - including other clinical centers in Genoa
- · The study is ongoing and, if successful, will provide relevant clinical and biological information about the impact of taskoriented rehabilitation in progressive MS

## REFERENCES

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