

COGNITIVE AND BEHAVIORAL FEATURES OF COVID-19 PATIENTS IN POST-ACUTE PHASE

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INTRODUCTION AND OBJECTIVES

The neurological consequences of COVID-19 remain to be elucidated.

Acting on ACE2 receptors as entry pathway, COVID-19 might dysregulate the renin-angiotensin system that has a crucial role in lung injury and influences a number of physiological and behavioural functions including the onset of cognitive impairment (Wright et al., JAD 2019).

ACE2 is widely distributed in the brain and has been linked to anti-hypertensive, anti-atherosclerotic, anti-thrombotic and neuroprotective effects.

The aim of this study is to explore cognitive and behavioural features within two months from hospital discharge in a cohort of patients with confirmed COVID-19.

METHODS

Inclusion criteria

- ✓ Adult patients with recent (60 ± 15 days) admission to Emergency Department, with **PCR-confirmed diagnosis of COVID-19**;
- ✓ **Good recovery with functional independence** ($mRS \leq 2$);
- ✓ **Objective and/or self-reported cognitive disturbances**, observed at neurological evaluation performed at **2-months follow-up** visit;
- ✓ Informed consent to perform **same-day** neuropsychological testing, EEG and MRI.

We enrolled 49 patients (aged between 28-80 years, 73% men) and we split the sample based on age (yC-19, age < 50, N=8, 37% men; mC-19, age range 50-64, N=21, 76% men; oC-19, age ≥ 65 , N=20, 85% men).

All patients underwent:

- a comprehensive neuropsychological assessment investigating the main cognitive functions. A clinical interview was also performed to investigate the presence of mood alterations and/or features of post-traumatic stress disorder (PTSD) at the time of the visit.
- A MRI scan (3.0 Tesla) with 3DT1-weighted sequences.

Data processing and statistical analyses

- The frequencies of cognitive and behavioural alterations, with respect to the normative data, were reported for the total sample and for each sub-group.
- Gray matter (GM), white matter (WM) and total brain volumes were obtained for all patients with using SIENAX.
- In all patients, correlations were tested between neuropsychological scores, brain volumes, and the severity of acute-phase respiratory symptoms at the time of hospital admission.

RESULTS

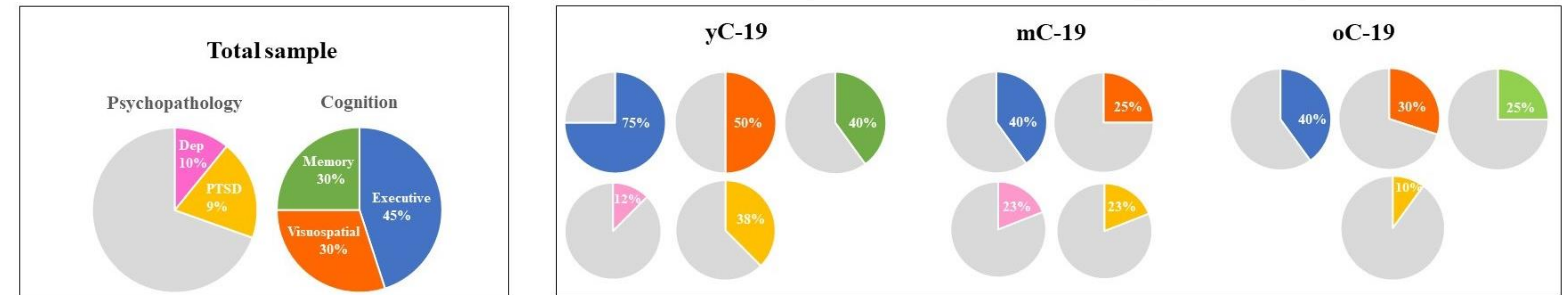


Figure 1. Percentages of psychopathological and cognitive disturbances in all patients (Total sample) and in the sub-samples split according to age. Mood alterations (in pink colour) and post-traumatic stress disorder (PTSD) symptoms (in yellow) were investigated through a clinical interview. The presence of cognitive abnormalities were defined according to normative values. Executive functions (in blue) were assessed using the frontal assessment battery, the symbol digit modalities test, the digit span backward, the trail making test, the cognitive estimates, and the phonemic fluency; memory (in green) was assessed using the digit span forward, the Rey Auditory Verbal Learning Test, and the Figure's Rey recall; visuospatial abilities (in orange) were investigated using the Figure's Rey copy and the Visual Object and Space Perception battery; language was assessed using the Screening for Aphasia in NeuroDegeneration (SAND; no language difficulties were detected). Abbreviations: yC-19=Young patients (<50 years); mC-19=Middle-age patients (50-64 years); oC-19=Old patients (≥ 65 years).

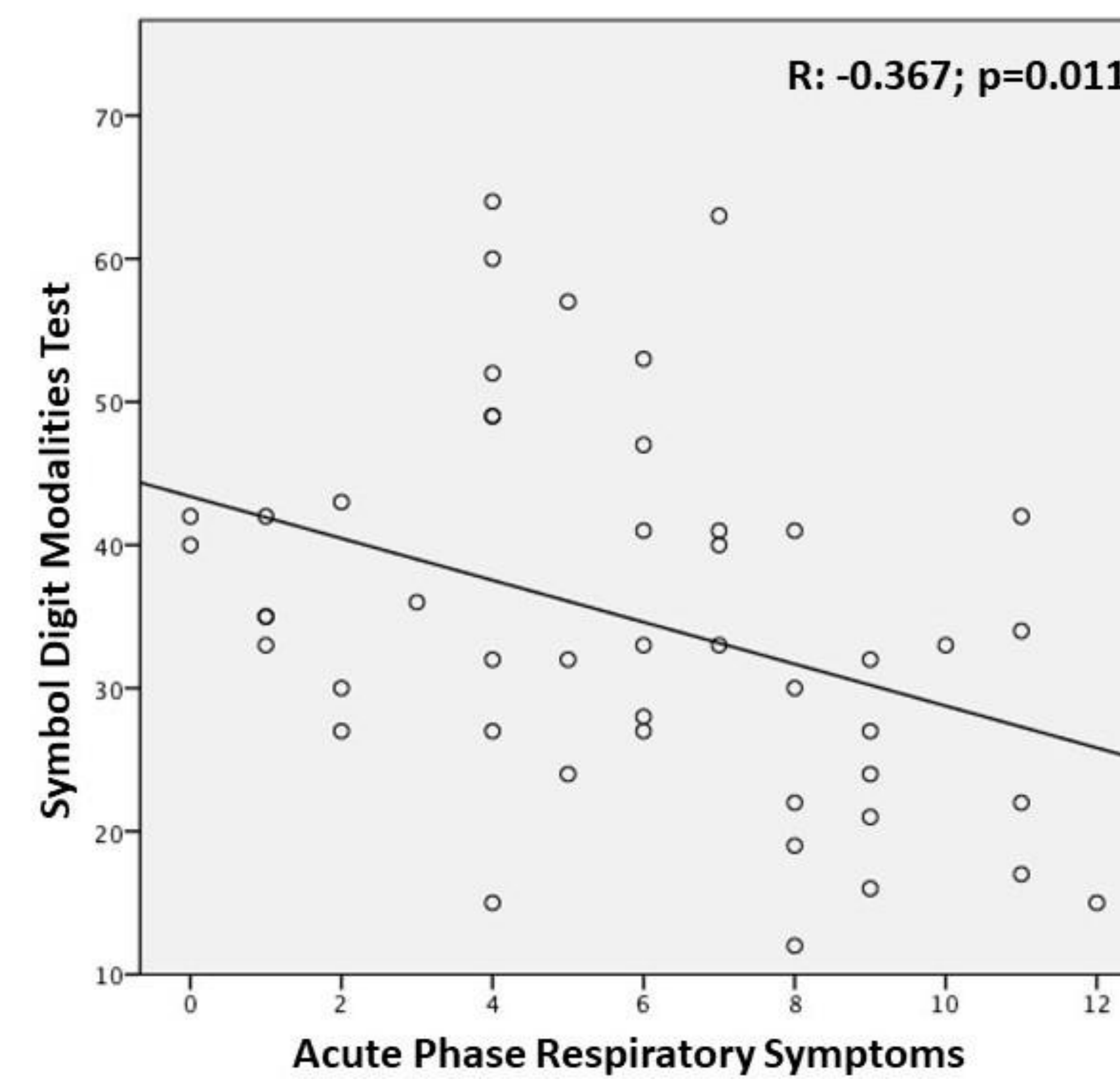


Figure 2. Negative relationship between the patients' performances at the symbol digit modalities test and the severity of acute phase respiratory symptoms at the hospital admission. R reflects Pearson's Test.

No significant correlations were observed between psychopathological and cognitive scores and GM, WM and total brain volumes.

All patients showed a negative relationship between the patients' performances at the symbol digit modalities test and the severity of acute phase respiratory symptoms at the hospital admission (**Figure 2**).

CONCLUSIONS

- ✓ This study showed that cognitive and behavioural alterations are associated with COVID-19 infection within two months from hospital discharge
- ✓ In the total sample, the frontal executive dysfunctions were associated to the severity of acute-phase respiratory symptoms at the hospital admission
- ✓ The patients cognitive/behavioural disturbances were independent from their brain structural integrity
- ✓ The cognitive and behavioural symptoms were more severe in the youngest group
- ✓ Whether these alterations are directly linked with the infection itself or with its related consequences is still to be determined, as well as whether they are reversible or part of a neurodegenerative process.