

EFFECTS OF CARDIOPULMONARY REHABILITATION ON CARDIORESPIRATORY FITNESS AND CLINICAL SYMPTOMS IN LONG-COVID-19 SYNDROME: RESULTS FROM THE COVID-REHAB RANDOMIZED CONTROLLED TRIAL

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Introduction: Long-COVID-19 syndrome affects around 15% of adults infected by the SARS-CoV-2 virus. It is a multi-system disease characterized by more than 100 documented symptoms including exhaustion, breathlessness, pain and cognitive issues. Long-COVID, refers to long-term symptoms that some people experience at least 3 months after they have had a COVID-19 infection. Long-COVID significantly impacts quality of life and can hinder individuals from effectively carrying out their daily activities, such as work or household chores. Physical deconditioning and reduced exercise capacity could be implicated in the general symptomatology (1, 2). Some studies have evaluated the effect of rehabilitation programs on symptom occurrence and physical functions (1), but randomized controlled trials are needed (2).

Objective: To investigate the effectiveness of an eight-week cardiopulmonary rehabilitation program on cardiorespiratory fitness (VO₂peak), physical functioning (functional tests) and symptom burden in individuals with long-COVID-19.

Methods:
Population
40 participants
 n=26
 ♀ n=14
 Main symptoms: breathlessness and fatigue
 mean age 53±11 years
 mean days with long-COVID 424±220 days



Long-COVID Syndrome

Intervention:

Randomized into 2 groups (1:1)

1. centre-based individualized rehabilitation program
2. control: individuals were asked to maintain their daily habits

Individualized Rehabilitation Program: 8 weeks

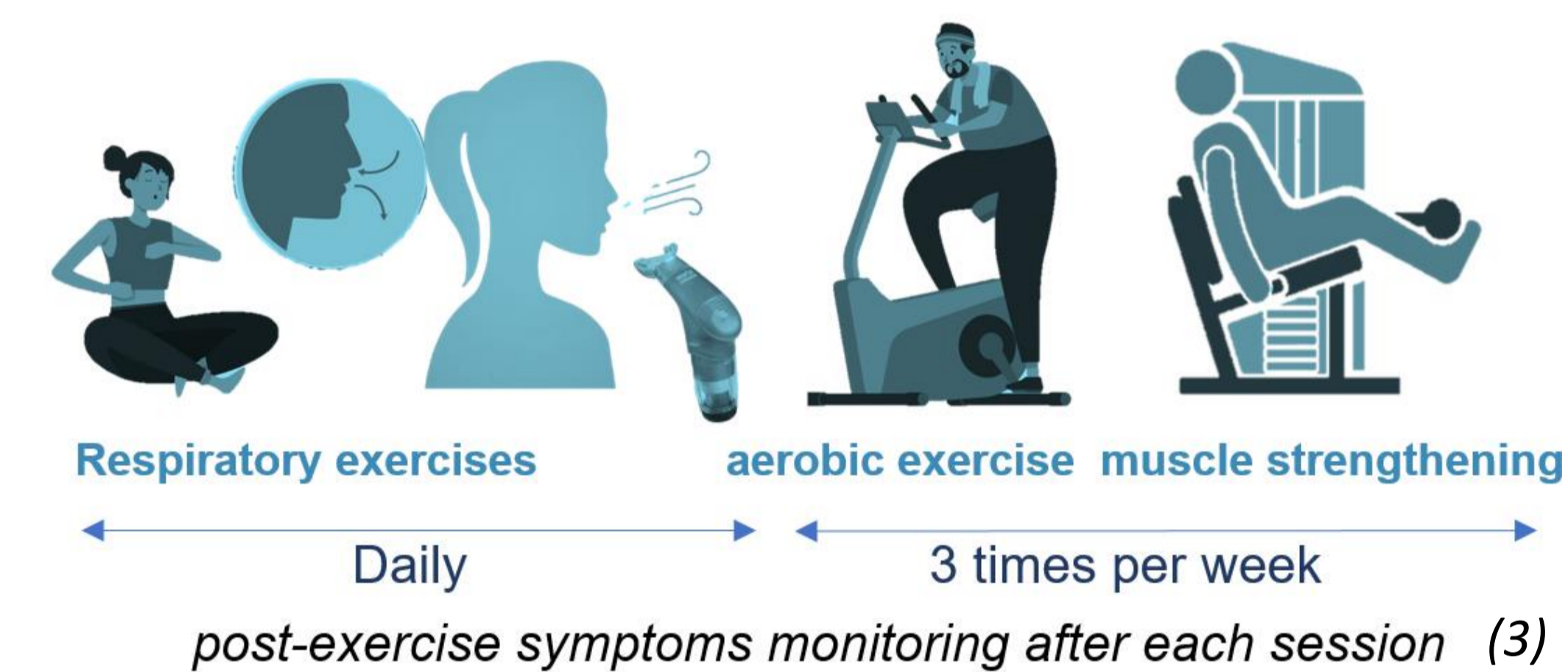


Table 1: baseline characteristics on the overall included participants

	n=40
Age (years)	53.37 ± 11.14
Sex (F n=, %)	26 (65%)
Height (cm)	166.37 ± 8.02
BMI (kg.m ²)	29.40 ± 6.16
Long-COVID (days)	424.32 ± 219.86
VO ₂ peak (mL.kg.min)	19.47 ± 4.91
VO ₂ peak (% predicted)	86.79 ± 16.26
PCFS categories* (0-I/II/III)	(2/13/20)
Date (classified by period) of infection by SARS-COV2	
May to december 2020	33%
January 2021 to june 2021	28%
July 2021 to december 2021	15%
January 2022 to july 2022	25%
Hospitalized	12.5%
ICU hospitalization	7.5%
Not hospitalized	80%

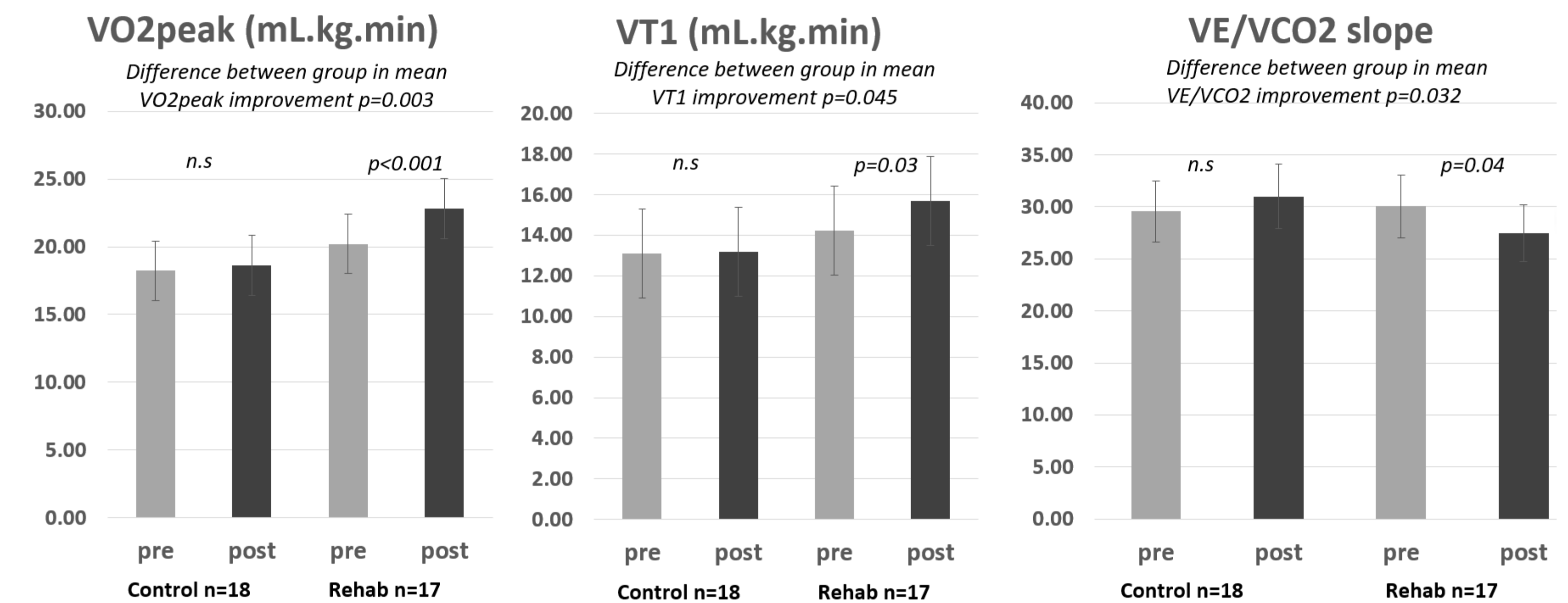


Table 2: Impact scales of the long COVID syndrome

	Control n=18			Rehab n=17			ANCOVA
	pre	post	p	pre	post	p	
Impact scales of the long COVID syndrome (from 1 to 10)*							
Impact on personal activities	6.75 ± 2.81	6.38 ± 2.96	0.520	6.66 ± 2.16	4.53 ± 2.13	0.002	0.016
Impact on family life	5.69 ± 3.40	6.44 ± 3.24	0.340	6.07 ± 2.19	4.40 ± 2.38	0.007	0.018
Impact on professional life	6.88 ± 3.46	7.06 ± 3.34	0.704	7.33 ± 3.11	6.07 ± 3.41	0.005	0.026
Impact on social life	6.06 ± 3.32	6.88 ± 2.73	0.210	7.06 ± 2.28	4.93 ± 2.15	0.004	0.002
Impact on morale, mood	4.88 ± 3.40	5.94 ± 2.95	0.021	6.20 ± 2.34	3.67 ± 2.38	<0.001	<0.001

*No impact=1 and maximum impact=10

Table 3: Functional tests

Functionnal tests	pre	post	p	pre	post	p	ANCOVA
TUG usual speed (s)	8.16 ± 1.78	8.22 ± 2.25	0.923	8.25 ± 1.64	6.99 ± 1.39	0.004	0.031
TUG fast speed (s)	6.29 ± 1.16	6.26 ± 1.42	0.895	6.27 ± 1.22	5.56 ± 1.32	0.008	0.066
6MWT (m)	496.7 ± 98.2	482.5 ± 81.1	0.170	499.4 ± 110.6	548.9 ± 130.3	0.018	0.010

*TUG: Timed up and go test; 6MWT: 6 min walking test

Conclusion: An individualized and supervised cardiopulmonary rehabilitation program was effective in improving cardiorespiratory fitness, ventilatory efficiency and symptom burden in individuals with long-COVID-19. Prior to initiating a rehabilitation program, it is essential to conduct a clinical evaluation of these patients. Additionally, careful monitoring of symptoms is important to appropriately tailor and adapt the rehabilitation sessions. [Clinicaltrials.gov: NCT05035628](https://clinicaltrials.gov/ct2/show/study/NCT05035628).

References: (1) Jimeno-Almazan A, Buendia-Romero A, Martinez-Cava A, Franco-Lopez F, Sanchez-Alcaraz BJ, Courel-Ibanez J, et al. Effects of a concurrent training, respiratory muscle exercise, and self-management recommendations on recovery from post-COVID-19 conditions: the RECOVE trial. *J Appl Physiol* (1985). 2023;134:95-104. (2) Besnier F, Berube B, Malo J, Gagnon C, Gregoire CA, Juneau M, et al. Cardiopulmonary Rehabilitation in Long-COVID-19 Patients with Persistent Breathlessness and Fatigue: The COVID-Rehab Study. *Int J Environ Res Public Health*. 2022;19. (3) Cotler J, Holtzman C, Dudun C, Jason LA. A Brief Questionnaire to Assess Post-Exertional Malaise. *Diagnostics (Basel)*. 2018;8.