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CHAOTIC BREATHING IN POST COVID-19 BREATHLESSNESS: A KEY FEATURE CHARACTERISED BY APPROXIMATE ENTROPY

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Abstract P142 Table 1 Baseline characteristics and exercise measurements

	Post COVID-19 BPD (N = 20)	Non-COVID BPD (N = 20)	Healthy controls (N = 15)
BASELINE CHARACTERISTICS			
Age/years	41 (10)	49 (14)	50 (18)
Gender M:F	6:14	6:14	9:6
BMI (kg/m ²)	25 (4)	26 (5)	25 (4)
Nijmegen score (/64)	23 (12–44)	23 (14–41)	-
FEV1 (% pred)	111 (13)	107 (16)	96 (6)
FVC (% pred)	118 (14)	114 (16)	107 (12)
FEV1/FVC Ratio	80 (6)	78 (6)	75 (12)
Resting SpO ₂ (%)	98 (95–100)	99 (94–100)	97 (96–99)
Resting HCO ₃ – (earlobe) (mmol/L)	24 (5)	22 (3)	24 (2)
Resting PaCO ₂ (kPa)	4.4 (0.8)	4.3 (0.7)	4.7 (0.5)
Resting BORG CR-10 dyspnoea (/10)	0.7 (0.8)	1.4 (1.3)	0.2 (0.6)
PEAK exercise CPET Variables			
Duration of test (minutes)	10 (4)	9 (2)	15 (3)
Main reason cited for exercise cessation	Legs = 6 Breathing = 14	Legs = 8 Breathing = 12	Legs = 6 Breathing = 4
BORG CR-10 dyspnoea (/10)	End=5.3 (2.3)	End=4.2 (1.5)	End=4.1 (1.7)
Peak VO ₂ (L/min)	2.18 (0.87)	1.52 (0.62)	2.77 (1.22)
Peak VO ₂ (% predicted)	106.5 (33.1)	79.8 (17.5)	124.8 (27.3)
Peak VO ₂ (mL/min/kg)	29.6 (7.6)	20.7 (7.1)	37.8 (14.8)
Peak Heart Rate (beats/min)	170 (12.6)	141 (26)	167 (15)
Heart Rate Reserve (beats/min)	20 (19)	30 (20)	2 (13)
Peak VE (L/min)	89 (26)	60 (27)	96 (35)
Peak Tidal Volume (L)	2.6 (1.3)	1.86 (0.88)	2.37 (0.71)
Peak Breathing Frequency (/min)	43 (23)	31 (9)	33 (8)
Peak SpO ₂ (%)	97 (93–100)	99 (94–100)	95 (73–98)
PEAK exercise gas exchange values			
PaO ₂ (kPa)	13.3 (3.2)	13.8 (1.2)	13.7 (1.2)
PaCO ₂ (kPa)	4.4 (1.1)	4.2 (0.7)	4.1 (0.7)
PETCO ₂ (kPa)	4.4 (0.6)	4.3 (0.5)	4.8 (0.8)
P(A-a)O ₂ difference (kPa)	2.8 (1.2)	2.1 (0.9)	2.6 (0.9)
P(a-ET)CO ₂ difference (kPa)	-0.10 (0.25)	-0.09 (0.37)	-0.35 (0.53)
Approximate entropy (ApEn) of ventilatory variables during incremental exercise			
ApEn Tidal Volume	1.61 (0.05)	1.28 (0.23)	1.02 (0.29)
ApEn Breathing Frequency	1.40 (0.10)	1.41 (0.20)	1.32 (0.21)
ApEn Minute Ventilation	1.22 (0.11)	0.97 (0.30)	0.65 (0.23)

Data shown as mean (SD) or median (range); M:F: Male:Female; BMI: body mass index; FEV1: forced expiratory volume in the first second; FVC: forced vital capacity; SpO₂: oxygen saturation; CPET: cardiopulmonary exercise test; VO₂: oxygen consumption; VE:

Background Exertional dyspnoea is a pervasive clinical feature for many patients following COVID-19 infection, with a high prevalence of breathing pattern disorder (BPD) reported. In this study we aimed to characterise exercise ventilatory patterns in patients with exertional dyspnoea following COVID-19 infection, using a non-linear statistical approach.

Method Patients who underwent cardiopulmonary exercise testing (CPET) for unexplained exertional breathlessness following COVID-19 infection, confirmed on PCR or antibody testing, were audited, between May 20 and May 21. Those with evidence of persistent parenchymal changes, thromboembolic disease, or cardiac dysfunction were excluded. Ventilatory irregularity during exercise quantified by approximate entropy (ApEn) was assessed and compared to a historical cohort of controls with non-COVID19 related BPD and health individuals.

Results Over the study period, 20 patients (mean age 41 years (SD 10), 14 (70%) female) fulfilled inclusion criteria and underwent CPET at a median of 4 months (range 3–10) following infection. Chest and cardiac imaging was normal in all patients who had follow-up investigations. Spirometric indices were also normal and the mean (SD) DLCO and KCO were 83% (11.7) and 94% (9.5) predicted, respectively. On exercise testing, most COVID-19 patients stopped secondary to dyspnoea, with a BORG median at 5 (i.e. 'severe') but had a normal VO₂ peak (107% predicted) and gas exchange response, with low indices of VQ mismatching (table 1). ApEn was elevated for tidal volume and VE but similar to non-COVID BPD.

Conclusions Post COVID BPD can be characterised by application of non-linear statistical modelling of exercise ventilatory data. This approach now needs further validation to facilitate application in automated CPET equipment, to identify and highlight this important differential diagnosis.

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'IT GIVES YOU THAT HOPE, KNOWING THAT YOU ARE NOT ALONE' – THE JOURNEY OF COVID-19 RECOVERY AND THE REHABILITATION BOAT

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Introduction The persistent symptoms of COVID-19 are well documented.¹ There is encouraging early data for improvements in fatigue, exercise capacity and cognition in those attending a supervised rehabilitation programme.² There is no published data on its perceived acceptability. This study aims to understand patients' lived experience of recovery from this novel disease including experiences of attending a COVID-19 rehabilitation programme.

Methods Patients who attended COVID-19 rehabilitation were invited to take part in virtual focus groups or 1:1 interviews conducted by independent researchers. Inductive thematic analysis was used. A reflective log provided a transparent account of data collection and analysis. Transcripts were coded by the first author and one other researcher, themes were generated and agreed.