Rehabilitation management of autonomic dysregulation in Post COVID-19 Condition

World Health Organization
Expanding our understanding of Post COVID-19 Condition: Rehabilitation

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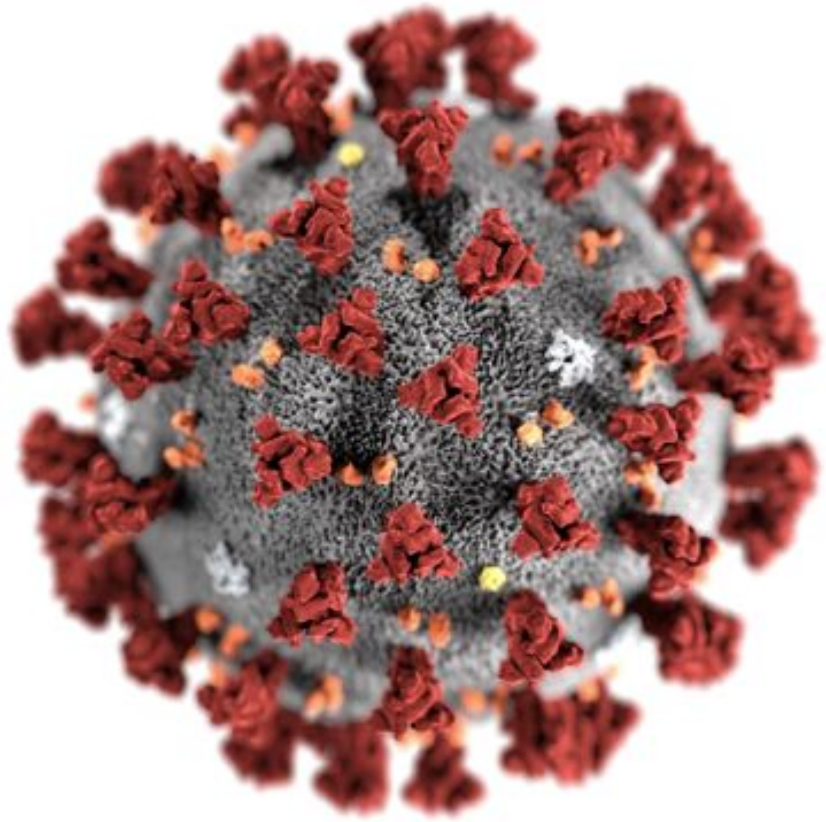
Identifying a novel post-viral syndrome



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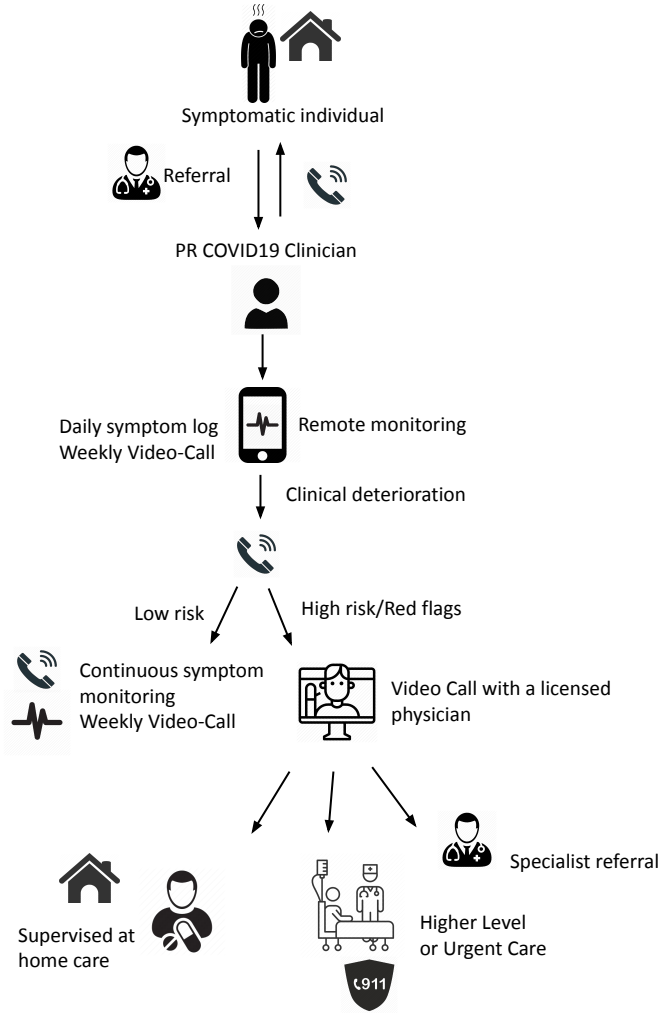
The Precision Recovery Protocol

Founders:
Dr David Putrino, PT, PHD
Dr. Christopher Kellner, MD



Tabacof, et al., Telemedicine and e-Health, 2020

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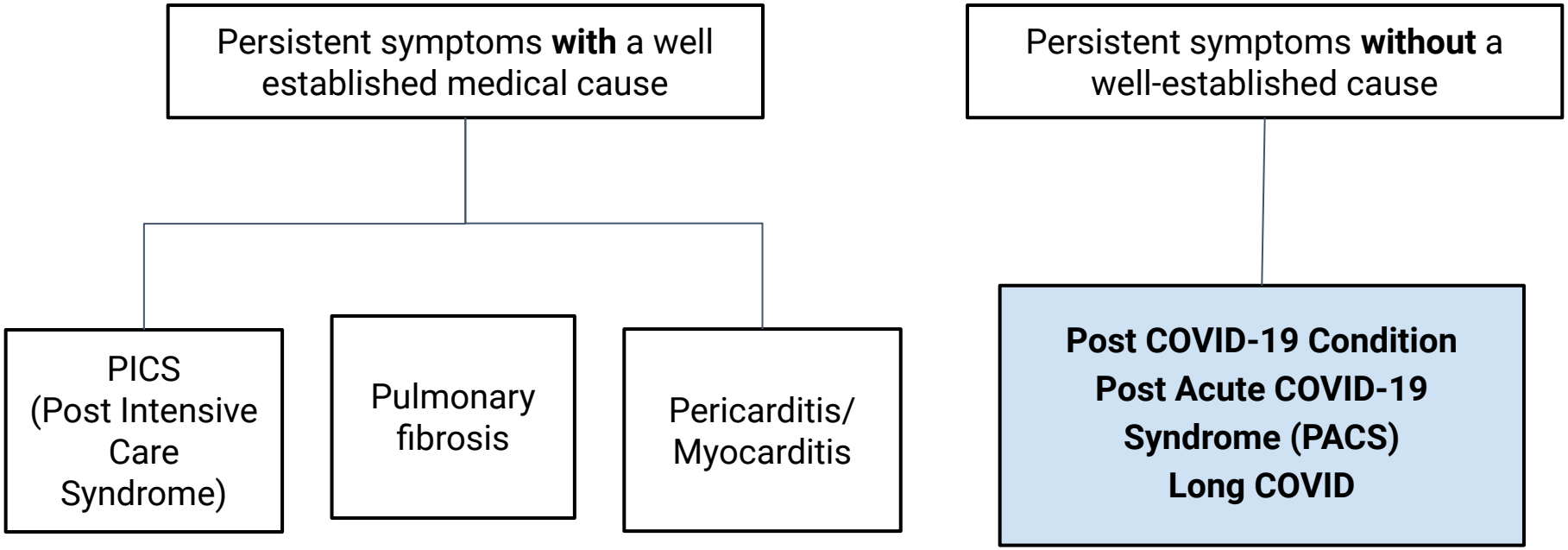
May 2020: A novel post viral condition starts to be identified



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Patient-reported survey determine rehabilitation needs and outcomes

Demographics; Past medical history; Employment, Physical activity; Testing (PCR/Antibody)/Vaccination status; Acute COVID Illness Severity; PACS: Symptom checklist; Exacerbating factors

Validated PROs:

- Breathlessness: Medical Research Council (**MRC**) Breathlessness Scale
- Fatigue: **Fatigue Severity Scale (FSS)** + VAS
- Health related QOL: **EuroQol EQ-5D-5L**
- Pain VAS
- Participation (**WHODAS**)
- Depression screening (Patient Health Questionnaire – 2 **PHQ-2**)
- Anxiety (Generalized Anxiety Disorder Assessment - **GAD-7**)
- Cognitive function (**NeuroQOL Cognitive Function** 2.0 8a)
- Sleep: **Epworth** sleepiness scale + Sleep VAS

Patient Reported Outcomes

Table 1. Patient (n=156) baseline demographic and COVID-19 related data

	All patients (n = 156)	Confirmed COVID-19 (87)	Presumed COVID-19 (69)
Female	107 (69)	54 (62)	53 (77)
Age y, median (range)	44 (13 to 79)	45 (13 to 79)	44 (14 to 79)
BMI kg/m², median (range)	24 (16 to 52)	24 (17 to 52)	24 (16 to 42)
Duration of symptoms in days, median (range)	351 (82 to 457)	350 (157 to 424)	355 (82 to 457)
PCR completed	98 (63)	57 (66)	41 (59)
PCR positive	34 (22)	34 (39)	0 (0)
Antibody test completed	149 (96)	86 (99)	63 (91)
Antibody positive	80 (51)	80 (92)	0 (0)
PCR and/or antibody positive	87 (56)	87 (100)	0 (0)
Hospitalized for COVID-19	17 (11)	16 (18)	1 (1)
Received COVID-19 vaccination*	87 (56)	45 (52)	42 (61)
Most prevalent comorbidities			
Cancer (any type)	30 (20)	10 (11)	20 (29)
Asthma	30 (20)	13 (15)	17 (25)
Anxiety	18 (12)	12 (14)	6 (9)
Depression	13 (8)	8 (9)	5 (7)
Hypertension	11 (7)	7 (8)	4 (6)

Data are presented as n (%) unless otherwise indicated. BMI = body mass index, PACS = post-acute COVID-19 syndrome, PCR = polymerase chain reaction. *All COVID-19 vaccination occurred after COVID-19 infection.

n=156

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Probable or confirmed SARS-Cov-2 infection (WHO)

Symptoms >12 weeks since initial symptom onset, not explained by an alternative diagnosis

Tabacof *et al*, 2021. Post-acute COVID-19 syndrome negatively impacts physical function, cognitive function, health-related quality of life and participation (AJPMR - accepted w/ minor revision)

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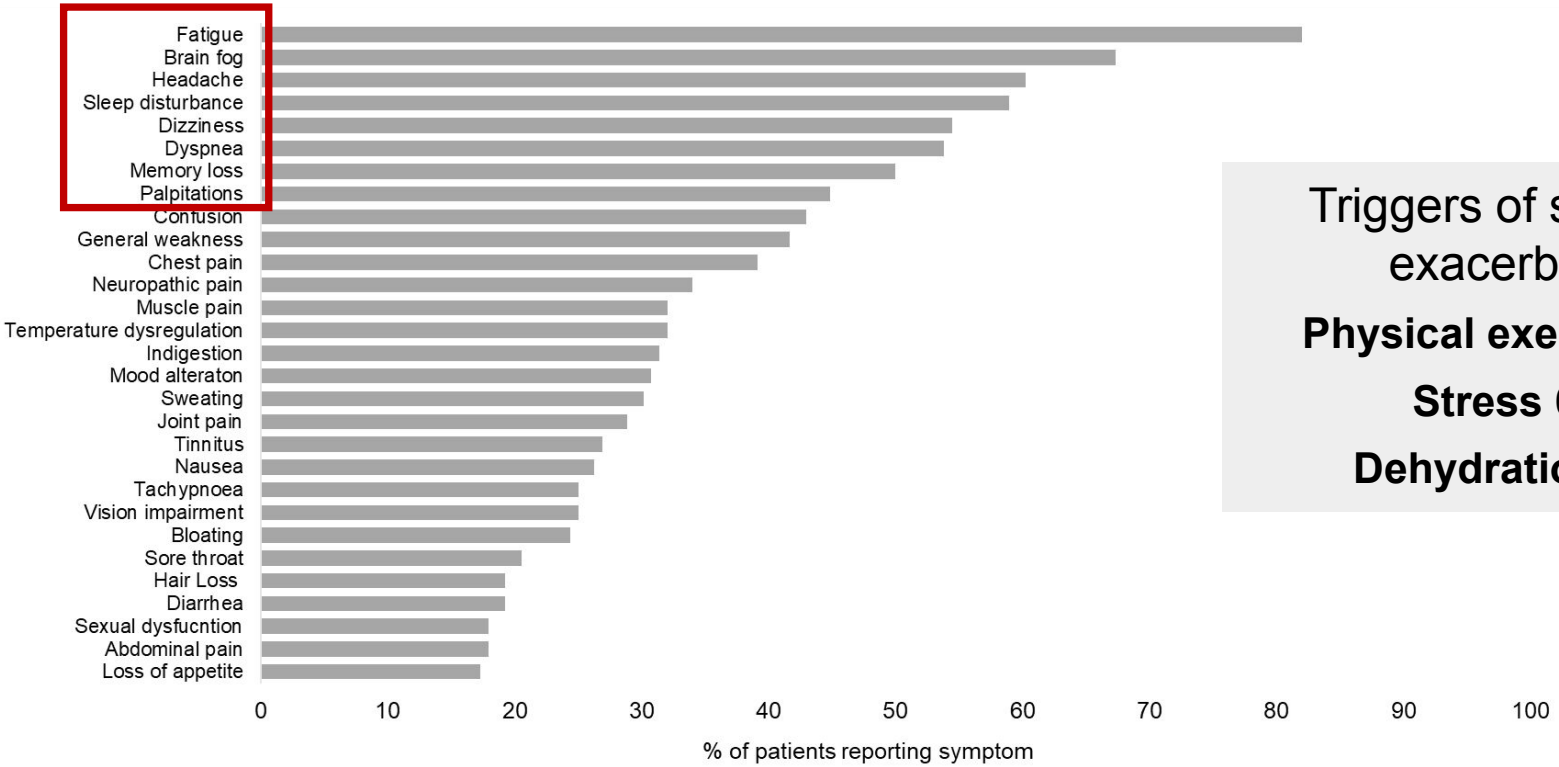

Triggers of symptom exacerbation

Physical exertion 86%

Stress 69%

Dehydration 49%

Tabacof *et al,* 2021 (AJPMR - accepted w/ minor revisions)

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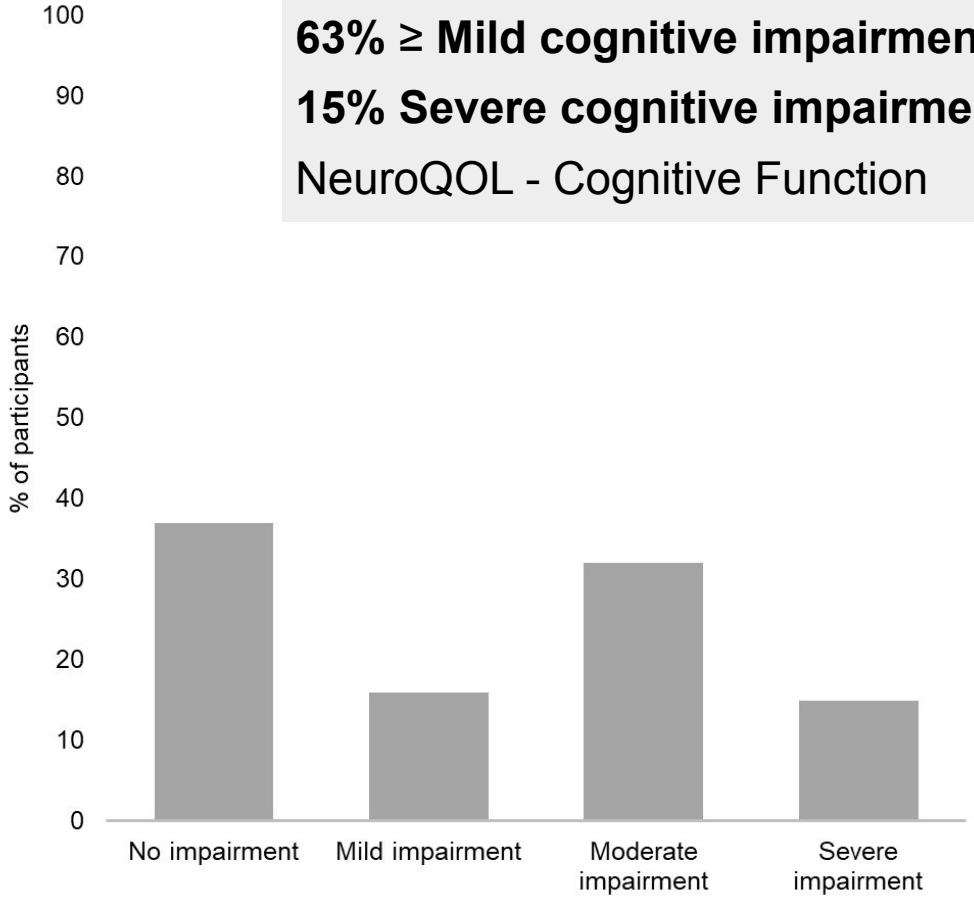

63% ≥ Mild cognitive impairment

15% Severe cognitive impairment

NeuroQOL - Cognitive Function

78% Debilitating Fatigue Fatigue severity score ≥4

40% Debilitating Dyspnea MRC breathlessness ≥3

Tabacof *et al*, 2021 (AJPMR - accepted w/ minor revisions)

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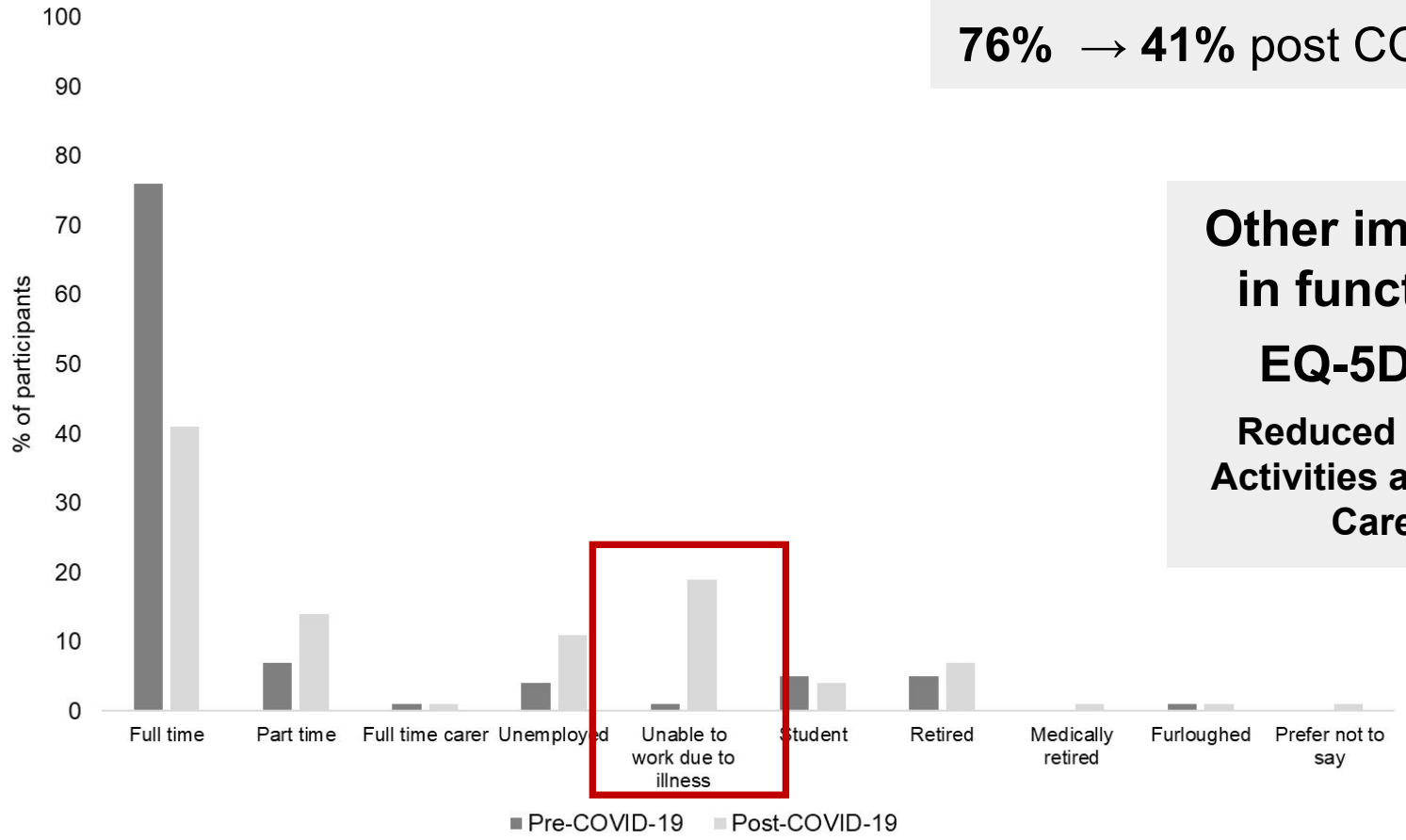
Full time employment:

76% → **41%** post COVID-19



Other impacts in function:

EQ-5D-5L

Reduced Usual Activities and Self Care

Tabacof *et al*, 2021 (AJPMR - accepted w/ minor revisions)

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Multi-systemic

Relapsing

Persisting Symptoms

Fatigue (82%)

Brain fog (67%)

Headache (60%)

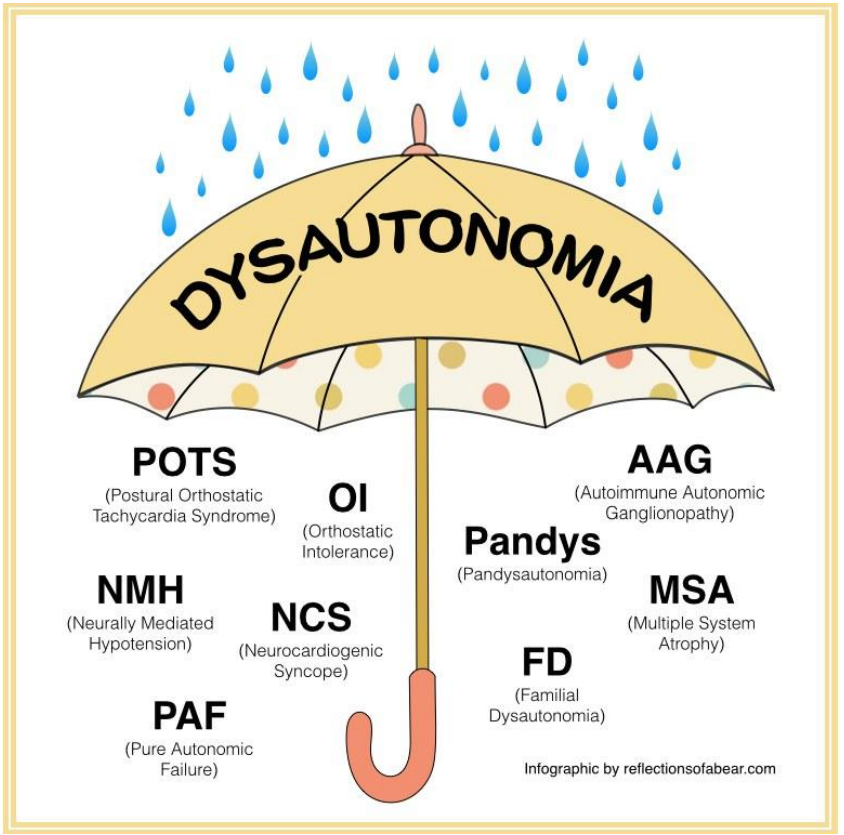
Dizziness (54%)

86%

Post-Exertional Symptom Exacerbation

Skepticism

Delayed/Missed diagnosis



Tabacof *et al*, 2021 (AJPMR - accepted w/ minor revisions)

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REVIEW ARTICLE

The extended autonomic system, dyshomeostasis, and COVID-19

David S. Goldstein[1]

RESEARCH ARTICLE

Autonomic dysfunction following COVID-19 infection: an early experience

Kamal Shouman[1] · Greg Vanichkachorn[2] · William P. Cheshire[3] · Mariana D. Suarez[1] · Shahar Shelly[1] · Guillaume J. Lamotte[1] · Paola Sandroni[1] · Eduardo E. Benarroch[1] · Sarah E. Berini[1] · Jeremy K. Cutsforth-Gregory[1] · Elizabeth A. Coon[1] · Michelle L. Mauermann[1] · Phillip A. Low[1] · Wolfgang Singer[1]

Clinical Medicine 2021 Vol 21, No 1: e63–7 COVID-19 RAPID REPORT

Autonomic dysfunction in 'long COVID': rationale, physiology and management strategies

Authors: Melanie Dani,[A] Andreas Dirksen,[B] Patricia Taraborrelli,[B] Miriam Torocastro,[C] Dimitrios Panagopoulos,[D] Richard Sutton[E] and Phang Boon Lim[F]

Potential mechanisms:

- **Autoimmunity**
- Proinflammatory **cytokine storm**
- **immune mediated** by the virus itself

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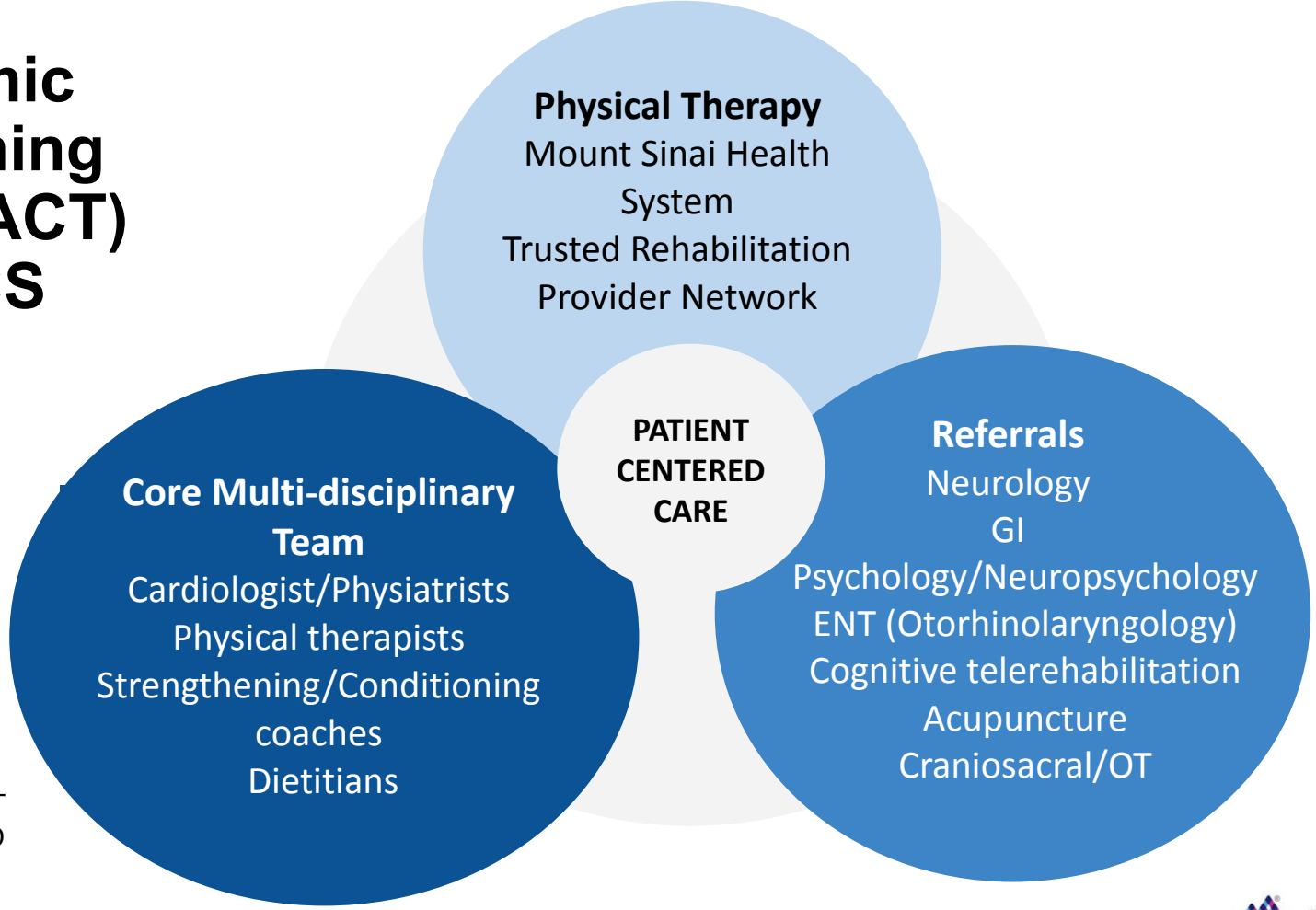
Mount Sinai Rehabilitation Care Model: Autonomic Conditioning Therapy (ACT) for PACS

Autonomic Conditioning Therapy (ACT) for PACS



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Dr. Amy Kontorovich, MD, PHD
Dr. Jamie Wood, PT, PHD
Ms. Adena Neglia, MS, RDN
Dr. Joseph Herrera, DO
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	KEY ELEMENTS FOR SAFE PHYSICAL ACTIVITY/EXERCISE PRESCRIPTION	ACTION
	**Post Exertional Symptom Exacerbation (PESE)** Worsening of symptoms 24-72 hours (up to weeks) following any physical or cognitive exertion	Symptom assessment during session + following days/weeks Symptom-titration Pacing Energy conservation Identify symptom exacerbating factors
	**Cardiac or Pulmonary Impairment** I.e myocarditis/pericarditis; lung fibrosis	Cardiac screening: Echocardiogram + EKG Investigate chest pressure/pain, breathlessness, tachypnea, tachycardia, palpitations, dizziness/syncope Interrupt exercise if any sign of distress.
	**Dysautonomia**	Screening: Active stand test Attention to signs of orthostatic intolerance Optimized fluid intake Compression garments Electrolyte supplementation

Adapted from: World physiotherapy response to COVID-19 briefing paper 9. World Physiotherapy; 2021

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INITIAL EVALUATION CARDIAC CLEARANCE

INITIAL EVALUATION
Past medical history
Symptoms
PROs

CARDIAC CLEARANCE
Echo + EKG
Active Stand Test

PREHABILITATION
4 WEEKS

BREATH WORK

Ventilatory Control
Diaphragmatic/nasal breathing exercises

Goal: Improve autonomic regulation

PHYSICAL THERAPY PROGRAM
≥12 WEEKS

Low-grade, Symptom-titred; Supervised
30-min 1:1 sessions 2x/week

PHASE Ia: Supine Movement
PHASE Ib: Upright Isometric Exercises

PHASE II: Aerobic Interval Training

PHASE III: Submaximal Aerobic Conditioning
Adapted Levine Protocol (Fu and Levine, 2018)

PROGRESSION:
Exertion (Borg RPE) + Symptom (VAS)

OUTCOMES:
PROs
6MWT/10MWT/Orthostatic Vitals

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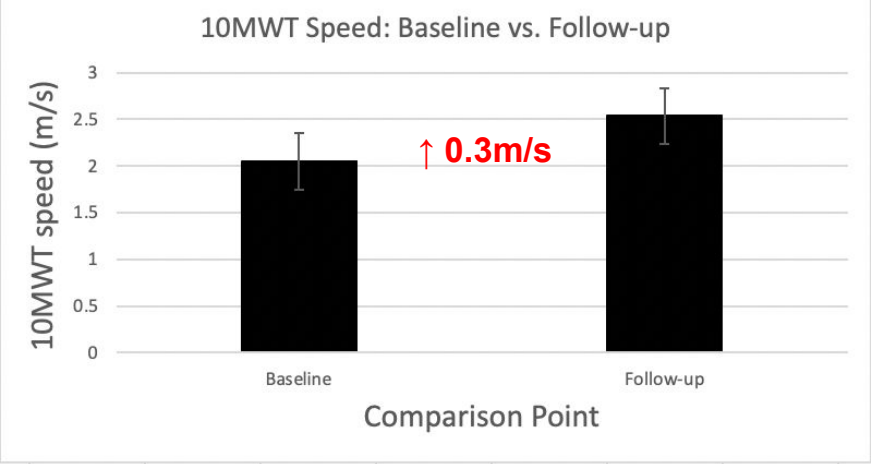
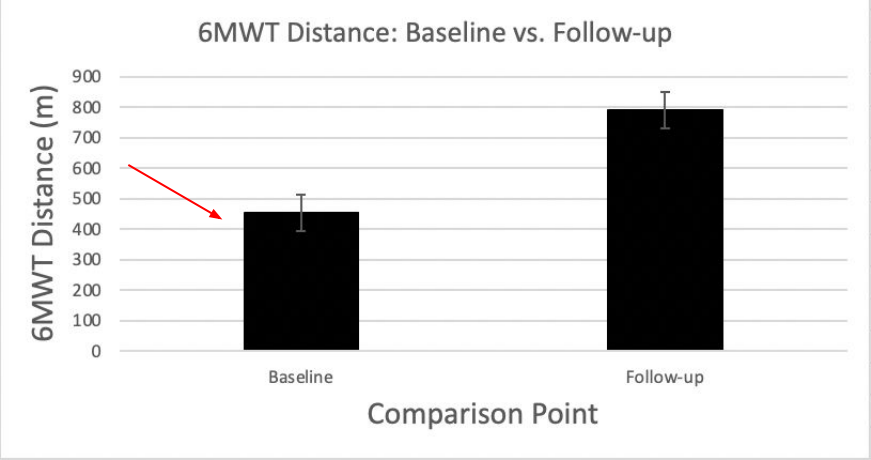
Preliminary data





Completed ACT for PACS (n=37)

- 45(13) y/o
- 86% Female
- Program duration: 90(11)d
- Symptom onset to program start: 251d
- Increase in 10MWT Speed (0.3m/s)*
- Increase in 6MWT Distance*

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Thank you

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RTW Charitable Foundation
American Association of Physical Medicine and Rehabilitation
World Physiotherapy
Frontline workers

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