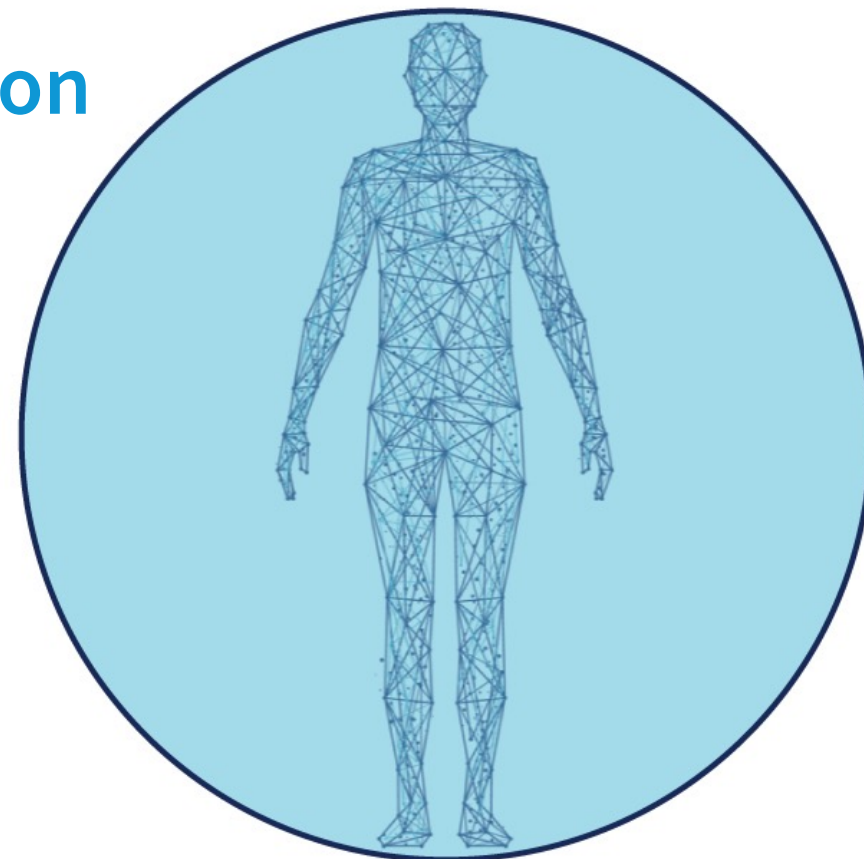


Neurological Treatment & Rehabilitation of Post-COVID-19 Condition: **Cognition, Dysautonomia, Dysphagia, Dysphonia**

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WHO Post-COVID-19 Case Definition

Post COVID-19 condition occurs in individuals with a **history of probable or confirmed SARS-CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms that last for at least 2 months and cannot be explained by an alternative diagnosis.** Common symptoms include **fatigue, shortness of breath, cognitive dysfunction** but also others* and generally have an **impact on everyday functioning.** Symptoms may be **new onset** following initial recovery from an acute COVID-19 episode or **persist** from the initial illness. Symptoms may also **fluctuate** or **relapse** over time.

Est. to be >15 million cases of
“long-COVID-19”

- Mean age 40s-50s

Persistent cognitive dysfunction:

- Reduce quality of life
- Limit participation in rehabilitative interventions
- Hinder return to work efforts

Rapid Design and Implementation of Post-COVID-19 Clinics

Lekshmi Santhosh, MD, MAEd; Brian Block, MD; Soo Yeon Kim, MD; Sarath Raju, MD, MPH; Rupal J. Shah, MD; Neeta Thakur, MD, MPH; Emily Pfeil Brigham, MD, MHS; and Ann Marie Parker, MD, PhD

THE AMERICAN JOURNAL
of MEDICINE.
Official Journal of the Alliance for Academic Internal Medicine

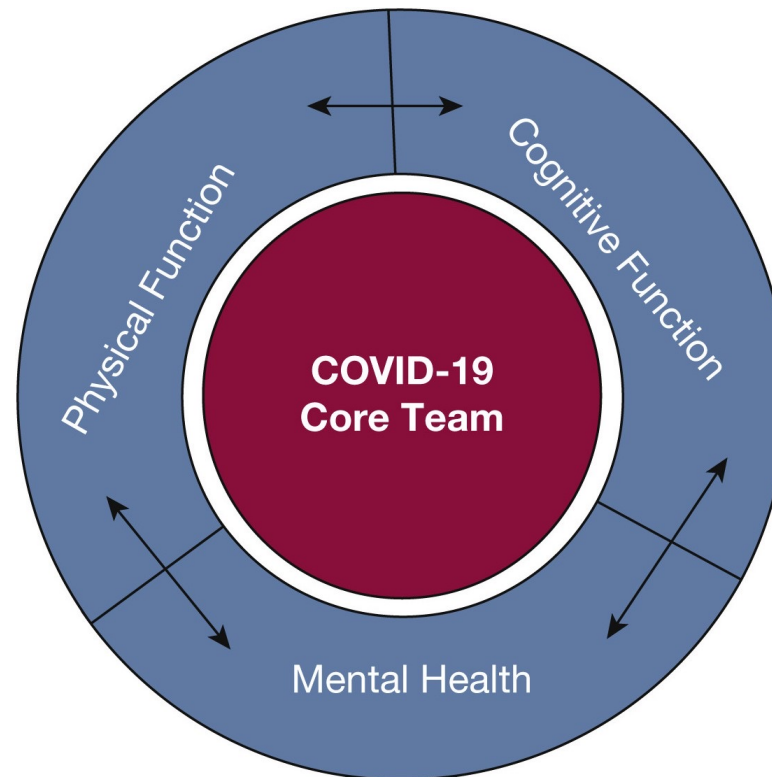
THE LANCET
Respiratory Medicine

CHEST

JH PACT: Johns Hopkins Post-acute COVID-19 Team

Core Team:

1. Pulmonary-Critical Care
2. Physical Medicine & Rehabilitation
3. Homecare PT/OT/SLP



Partnerships:

- Primary Care
- Psychiatry
- Psychology
- Neurology
- Cardiology
- Hematology
- Infectious Disease
- Nephrology
- Dermatology
- Hepatology
- Otolaryngology

Post-COVID-19 Cognitive Dysfunction

Cognitive Impairment After COVID-19—A Review on Objective Test Data

Rania Daroische^{1*}, Mathilde S. Hemminghyth^{1,2}, Thomas H. Eilertsen¹, Monica H. Breivik^{1,2,3} and Luiza J. Chwiszczuk^{2,3}

Conclude:
Patients with recent SARS-CoV-2 infection appear to experience global cognitive impairment, impairment in memory, attention and executive function, and in particular verbal fluency

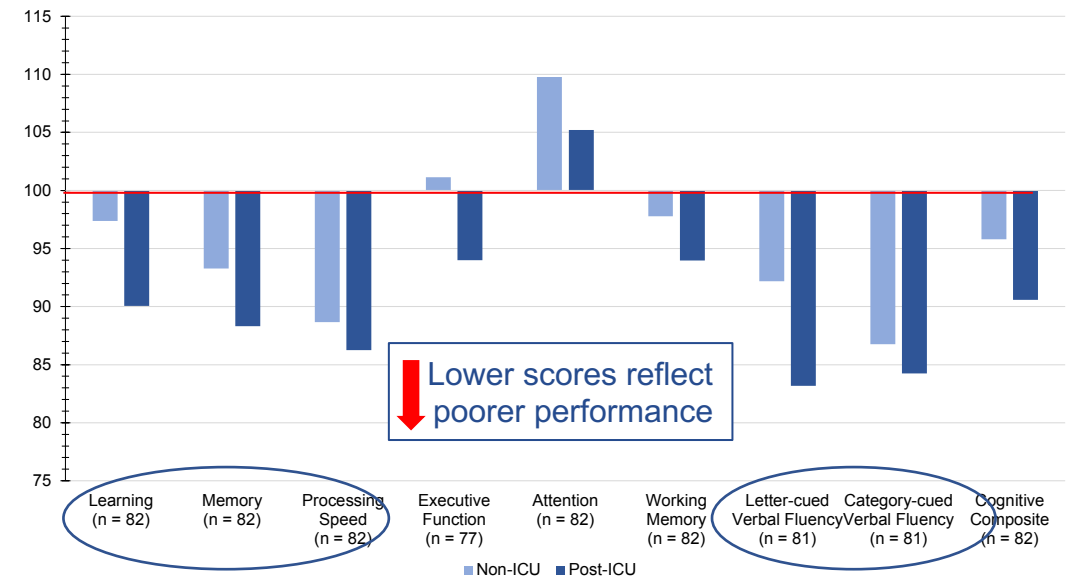
Assessment of Cognitive Function in Patients After COVID-19 Infection JAMA Network **Open**

Jacqueline H. Becker, PhD; Jenny J. Lin, MD, MPH; Molly Doernberg, MPH; Kimberly Stone, MPH; Allison Navis, MD; Joanne R. Festa, PhD; Juan P. Wisnivesky, MD, DrPH

Cognitive domain	Impaired (z score ≤ 1.5) Total (N = 740)
Attention	74 (10)
Working memory	74 (10)
Processing speed	133 (18)
Executive functioning	118 (16)
Phonemic fluency	111 (15)
Category fluency	148 (20)
Memory encoding	178 (24)
Memory recall	170 (23)
Memory recognition	74 (10)

Rates of Cognitive Dysfunction, Psychiatric Distress, and Functional Decline After COVID-19

Tracy D. Vannorsdall, Ph.D., Emily Brigham, M.D., M.H.S., Ashraf Fawzy, M.D., M.P.H., Sarath Raju, M.D., M.P.H., Alesandra Gorgone, B.S., Alexandra Pletnikova, B.A., Constantine G. Lyketsos, M.D., M.H.S., Ann M. Parker, M.D., Ph.D.,¹ Esther S. Oh, M.D., Ph.D.¹



Management of Cognitive Dysfunction

International Neuropsychological Society recommendations for the assessment of neurocognition, olfaction, taste, mental and psychosocial health

- Screen for subjective cognitive difficulties
 - Ask about changes in attention, concentration, memory, and word finding
 - Patient-reported outcome instruments
 - *Patient's Assessment of Own Functioning; PAOFI*
- Screen for objective cognitive difficulties
 - Screening instruments
 - *MoCA*
 - More extensive neuropsychological assessment



Management of Cognitive Dysfunction

- Identify and address modifiable factors affecting cognition
 - Delirium
 - Sleep dysregulation
 - Pain
 - Mental health
 - Polypharmacy and substance misuse
 - Poorly controlled medical comorbidities
- Consider
 - Blood laboratory studies: CBC, CMP, B12, Vitamin D-3, TSH
 - Neuroimaging

Management of Cognitive Dysfunction

- **Pharmaceuticals**
 - No medications have been shown to improve cognitive dysfunction post-COVID-19
- **WHO recommendations**
 - Cognitive rehabilitation
 - *Support patients via cognitive exercises and compensatory tools*
 - Encourage participation in daily activities that are meaningful

Management of Cognitive Dysfunction

Support for Rehabilitation Self-Management after COVID-19- Related Illness second edition



Managing problems with attention,
memory, and thinking clearly

- Have a schedule; Be active when less fatigued
- Minimize distractions
- Do one thing at a time
- Take frequent breaks; set reasonable goals; reward yourself
- Use compensatory strategies: notes, reminders, alerts
- Brain exercises

Evidence-Based Cognitive Rehabilitation: Systematic Review of the Literature From 2009 Through 2014

Keith D. Cicerone, PhD,^{a,b} Yelena Goldin, PhD,^{a,b} Keith Ganci, PhD,^c
Amy Rosenbaum, PhD,^d Jennifer V. Wethe, PhD,^e Donna M. Langenbahn, PhD,^{f,g}
James F. Malec, PhD,^{e,h} Thomas F. Bergquist, PhD,^e Kristine Kingsley, PsyD,^{f,g}
Drew Nagele, PsyD,^{i,j} Lance Trexler, PhD,^{h,k} Michael Fraas, PhD,^l
Yelena Bogdanova, PhD,^{m,n} J. Preston Harley, PhD^o

- **Attention**

- Direct-attention training and meta-cognitive strategy training

- **Memory**

- Internal (imagery, etc.) and external (notes, alarms) compensatory strategies

- **Language**

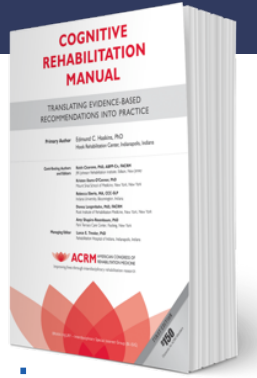
- Pragmatic conversational skills, etc.

- **Executive functioning**

- Meta-cognitive strategies (self-monitoring, self-regulation), explicit performance feedback

- **Comprehensive neuropsychological rehabilitation**

- Multimodal, computer-assisted cognitive retraining; emphasize patient-centered goal setting



Dysautonomia Management

- Identify underlying causes
 - Blood laboratory studies (CMC, CMP, TSH)
 - In-office evaluation for orthostatic hypotension or referral to tilt table testing
- Tailor treatment to the symptoms
 - Education, hydration, increasing salt intake, compression stockings
 - Breathing techniques – diaphragmatic, pursed-lip, boxed breathing
 - Consideration of midodrine, fludrocortisone, or Beta-blockers for hyperadrenergic POTS

Dysphagia & Dysphonia Management

- Guidelines emphasize modifications to minimize COVID-19 transmission risk
- Lack of treatment studies reporting efficacy for treatment of dysphagia or dysphonia after COVID-19
- WHO recommended patient self-management strategies include:
 - Talk frequently but do not strain the voice, hum, vocal rest when needed
 - Sip water, remain hydrated
 - Steam inhalation
 - Sit and remain upright when eating or drinking
 - Concentrate and consume slowly
 - Try different consistencies

Cognition, Dysautonomia, Dysphagia & Dysphonia Post-COVID-19

- Lack of empirically supported rehabilitation approaches
- We continue to need more research to determine:
 - The trajectory of cognitive changes, dysautonomia, dysphonia and dysphagia post-COVID-19
 - Predictors of persistent symptoms
 - The care needs of patients and their families
 - What are the most effective rehabilitative interventions?
 - *Administered to which patients?*
 - *And at what point in the recovery process?*

Thank you