

LETTER TO THE EDITOR

A bioprogressive approach for post-acute rehabilitation in elderly COVID-19 survivorsR. Saggini¹⁻², T. Paolucci¹, A. Bramanti² and R.G. Bellomo³

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To the Editor,

The recent COVID-19 pandemic has the potential to cause significant physical and mental damage in older people (1, 2). Also, the rise in the prevalence of comorbid chronic conditions and the aging of the world's population have increased the number of people who have been affected by COVID, effecting low survival rates. COVID-19 represents the pandemic of the century, with approximately 3.5 million cases and 250,000 deaths worldwide as of May 2020. Survivors report short-term and medium-term sequelae with respect to reduced pulmonary function (restrictive pattern), polyneuropathy, and sometimes poor lower and upper extremity strength and low functional capacity (myopathy) (3).

Overall, this postural biomechanical dysfunction syndrome is characterized by postural alterations and imbalance, with the loss of strength of the deep muscles of the spine and a myofascial syndrome that is related to alterations in muscle rheological parameters. These conditions include an increase in stiffness and a reduction in elasticity, which also occur in peripheral compressive neuropathies. Furthermore, patients emerge from prolonged periods of immobility and, during recovery, a forced posture is triggered, with mutation of the sacrum and lumbar straightening,

increased kyphosis, and anteposition of the head. At the same time, the near-constant use of personal protective equipment, such as masks, has led to an increase in energy expenditure that is associated with a reduction in respiratory capacity due to contracture of the diaphragm.

Subsequently, surviving COVID-19 patients need a comprehensive, integrated rehabilitation plan that includes a multidisciplinary and interdisciplinary team for all of these clinical aspects and rehabilitative dysfunctions. Moreover, optimizing one's function, at all ages, is a major global public health goal, particularly in the elderly (4). After recovery from COVID-19, patients manifest several functional impairments across many bio-psycho-social domains, and considering the physiological characteristics of the elderly, the pathological features of respiratory diseases, and the psychosocial disorders that existed prior to the COVID-19 epidemic, we suggest, as a recommended rehabilitative approach, a bioprogressive and sensorimotor rehabilitation plan with advanced physical energy, such as very-low-intensity and -frequency magnetic fields, focal vibration, and specific motor exercises. The use of an extremely low magnetic field (ELF-MF) is a potentially new treatment and preventive method with regard to biofilm, related to

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chronic infections, such as pulmonary disease, and for countering posttraumatic stress disorder (5, 6). A rehabilitation plan that implements motor exercises in terrestrial and aquatic microgravity environments improves automatic and cognitive processes and enhances attentional strategies, facilitating the integration of proprioceptive, visual, and vestibular information.

A bioprogressive rehabilitative approach, with the assistance of modern technological developments, such as microgravity-producing devices and techniques, enables personalized and targeted therapeutic approaches to be established, which appear to be the most effective in the rehabilitation and prevention of neuro-myo-sensory disorders that compromise the homeostatic body harmony, particularly in old age (7). For example, a rehabilitative program that combines a dynamic antigravity postural system (SPAD) and a vibration sound system (ViSS) for postural instability has shown efficacy in improving postural attitude and balance in patients with Parkinson's disease (8).

Furthermore, the oscillations that are produced by mechanical vibration activate proprioceptors (mainly Pacinian corpuscles and muscle spindles) and afferent nerve fibers, inducing long-term potentiation of the segmental levels and central circuits, increasing neuronal cortical excitability and the ability to produce enhanced muscle peak and the strength of muscle contractions. In this context, physical exercise should be specific for resistance or strength and flexibility to create better adaptive responses in aging patients, especially in post-COVID rehabilitation. Within the bio-progressive-integrated rehabilitation approach, thermal medicine and health resort-based rehabilitation can also become valid allies in the post-COVID patient in the outpatient setting (10).

The bioprogressive and multisensory rehabilitation plan, tailored to COVID patients, could reduce postural biomechanical syndrome and significantly improve the kinetic and kinematic actions that are related to segmental and global body movements during static and dynamic motion. Such integrated rehabilitation methods represent a future challenge for the outpatient management of COVID patients, meriting future research in this area.

REFERENCES

1. Feng F, Tuchman S, Denninger JW, Fricchione GL, Yeung A. Qigong for the prevention, treatment, and rehabilitation of COVID-19 infection in older adults [published online ahead of print, 2020 May 15]. *Am J Geriatr Psychiatry* 2020;10.1016/j.jagp.2020.05.012. doi:10.1016/j.jagp.2020.05.012.
2. Sheehy LM. Considerations for postacute rehabilitation for survivors of COVID-19. *JMIR Public Health Surveill* 2020; 6(2):e19462. doi:10.2196/19462.
3. Herridge MS, Moss M, Hough CL, et al. Recovery and outcomes after the acute respiratory distress syndrome (ARDS) in patients and their family caregivers. *Intensive Care Med* 2016; 42:725-38.
4. Heinemann AW, Feuerstein M, Frontera WR, et al. Rehabilitation Is a Global Health Priority. *BMC Health Serv Res* 2020;20(1):143. doi:10.1186/s12913-020-4962-8.
5. Di Bonaventura G, Pompilio A, Crocetta V, et al. Exposure to extremely low-frequency magnetic field affects biofilm formation by cystic fibrosis pathogens. *Future Microbiol.* 2014; 9(12):1303-1317. doi:10.2217/fmb.14.96.
6. Paolucci T, Pezzi L, Centra AM, Giannandrea N, Bellomo RG, Saggini R. Electromagnetic field therapy: a rehabilitative perspective in the management of musculoskeletal pain – a systematic review, *J Pain Res.* 2020; 13:1385–1400. doi: 10.2147/JPR.S23177.
7. Pokorski M, Barassi G, Bellomo RG, Prosperi L, Crudeli M, Saggini R. Bioprogressive Paradigm in Physiotherapeutic and Antiaging Strategies: A Review. *Adv Exp Med Biol.* 2018;1116:1-9. doi:10.1007/5584_2018_281.
8. Di Pancrazio L, Bellomo RG, Franciotti R, et al. Combined rehabilitation program for postural instability in progressive supranuclear palsy. *NeuroRehabilitation.* 2013;32(4):855-860. doi: 10.3233/NRE-130909.
9. Masiero S, Maccarone MC, Agostini F. Health resort medicine can be a suitable setting to recover disabilities in patients tested negative for COVID-19 discharged from hospital? A challenge for the future. *Int J Biometeorol* 2020;64(10):1807-1809. doi: 10.1007/s00484-020-01947-4.