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Editorial: Eccentric Training for Patients Recovering from COVID-19

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Dear Editor

The "SARS-CoV-2" epidemic has caused great worldwide concern, and medical experts are working seriously to find effective management for the disease and its complications.Unfortunately, by September 1, 2021, more than 218 million people had been contaminated by a coronavirus, and over 4,536,000 patients had perished as a result of the outbreak (1). Severe cases of coronavirus-2019 (COVID-19) are associated with the development of multisystem inflammatory reaction mediated by a cytokine storm, which has been attributed to excessive inflammation to lung, heart, liver, and other organs in coronavirus-infected patients (2-4). COVID-19 induces considerable weight loss, mostly in muscle mass as well as general fatigue/weakness (5). The cytokine storm appears to be linked to the activation of the ubiquitin–proteasome system, which mediates protein degradation (6). Aside from the overall inflammatory response, ACE2 receptors mediated muscle deterioration through hypoalbuminemia, which might explain the loss of skeletal muscle mass in patients with COVID-19. In addition to high levels of cytokine storm caused by SARS-CoV-2, prolonged bed rest is another important cause of muscle waste (5, 6). Inflammatory markers (Interleukin-6, tumor necrosis factor alpha, and C-reactive protein, and hypoalbuminemia) are correlated with elevated creatine kinase levels, indicating muscle tissue breakdown as a result of COVID-19, accompanied by cachexia and sarcopenia (6).

Unfortunately, bed rest has a variety of unfavorable outcomes for patients, especially the elderly. Prolonged bed rest causes cardiovascular and pulmonary deconditioning, which is accompanied by orthostatic intolerance and decreased functional performance, such as walking, standing from a chair, et cetera, consequently reducing the patient's quality of life (7).

Therefore, severe pulmonary damage similar to chronic obstructive pulmonary disease (COPD) and serious muscle atrophy are two major sequelae after surviving COVID-19, which requires serious medical attention and rehabilitation care (8).

COVID-19 also has negative psychological consequences in addition to its severe and long-term physical complications. Patients' mental disorders, such as depression and anxiety, have risen as a result of it. Furthermore, there has been a correlation between low muscle mass and poor mental health in the elderly. Patients with low muscle mass were shown to have a slightly poorer quality of life, increased symptoms of depression, and poor cognitive function over a 6-month follow-up period as compared with patients with normal muscle mass (9).

Consequently, it is predicted that a large number of improved COVID-19 patients after longer periods of hospitalization would need a novel approach to rehabilitate the cardiopulmonary and musculoskeletal systems (10).

Despite the benefits of physical training in decreasing musculoskeletal complications and improving mental health and function, most patients after recovery find it difficult to exercise because of muscle weakness, general fatigue, or improper training. Since their cardiorespiratory function and muscles are both seriously affected, identifying the appropriate training for patients with COVID-19 is challenging.

Eccentric training, characterized by elongation of the muscle during contraction, is an effective therapeutic approach that enhances muscle strength in patients with lower ventilatory and metabolic demands than conventional training (11). Several studies have shown that eccentric training is well-tolerated, safe, and feasible, especially for patients whose physical tolerance and respiratory capacity have been reduced, such as patients with coro-

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nary artery disease (12), Parkinson disease (13), cancer (14), and COPD (15).

Eccentric training (both eccentric riding and downhill walking) has been shown to improve whole-body exercise capability to a comparable level as concentric training. The low ventilatory cost is one of the most important advantages of eccentric training. At the same workload, the eccentric oxygen requirement was just one-sixth to one-seventh of that of concentric exercise. The two distinguishing characteristics of eccentric training—high force output and low energy cost—make it an effective approach for developing muscle mass and strength without adding any extra load on the cardiopulmonary system(15).

Eccentric training, such as downhill walking used as a regular function (11, 15), could be a viable choice in patients recovering from COVID-19 at the early stages of rehabilitation to inspire them to begin exercise for improving their cardiopulmonary and muscular dysfunctions. However, further research is needed to standardize the intensity, duration, and modes of eccentric training as well as proper timing to ensure patient safety.

In general, moderate-intensity exercise is recommended to enhance immune function, as it has anti-inflammatory properties that modulate the immune system. Eccentric training is widely acknowledged and strongly suggested for the rehabilitation of patients with COPD, congestive heart failure, COVID-19, and any debilitating conditions to improve cardiopulmonary and musculoskeletal efficiency (10, 11, 13, 16). It seems that rehabilitation based on an eccentric approach can confidently be considered in patients with COVID-19 suffering from complications, such as muscle mass loss and pulmonary dysfunction, to accelerate their recovery and improve their life quality, particularly in the elderly.

Conflict of Interests

The author has no conflict of interests to declare.

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