



Exercise Program for Covid-19 Survivors: A Telerehabilitation Framework

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ABSTRACT

Coronavirus disease (COVID-19) is a serious acute respiratory syndrome that has been recognized as a pandemic disease caused by Coronavirus 2 (SARS-CoV-2). The complications related to coronavirus itself, physically inactive period due to symptoms of disease and lockdown may also influence the functional capacities of COVID-19 survivors negatively. It may lead to obstructions in engaging with previous activities of daily living. As a physiotherapy intervention, exercise treatment is one of the novel approaches to support these individuals after the COVID-19 treatment. However, there is limited access to physiotherapy and rehabilitation services during pandemic conditions because of lockdown, especially for infected patients. For increasing accessibility to physiotherapy and rehabilitation care, the World Confederation of Physical Therapy has published a report advising the home-based exercise interventions via Telerehabilitation. Up to date, there is no published framework for structured exercise programs for this population, yet. Since the individual differences in functional levels and possible differences in the severity of coronavirus infection, the physiotherapy, and rehabilitation exercise program should be structured individually for COVID-19 survivors. This document suggests a framework for physical therapists to put into practice an exercise training via telerehabilitation in COVID-19 survivors. The proposed framework has consisted of determination of eligible and risky COVID-19 patients for intervention, physiotherapy assessment tools, 6-week exercise prescription based on FIIT-VP principle (frequency, intensity, time, type, volume, and progression) and criteria for ending exercise.

Keywords: COVID-19, Telerehabilitation, Exercise.

1. INTRODUCTION

COVID-19 disease, an infection caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2), was firstly reported in the world on 31 December 2019. COVID-19 contamination occurs easily with contact respiratory droplets, via contact with infected persons, or contaminated objects and surfaces (1,2). The average incubation period of the infection varies between 2-14 days (3).

Up to end of July 2020, 216 countries, areas or territories affected by COVID-19 pandemic with more than 15 million infected cases worldwide have been reported by the World Health Organization. Turkey is one of the most affected countries in the world with the number of 227,982 infected cases (4). While 80% of people with COVID-19 virus have mild to moderate disease-specific symptoms, 6.1% of patients require treatment in the intensive care units (5). Among these cases, 210,400 have recovered and 5,600 have died by the fatality rate of 2,48% in Turkey (4).

After recovery COVID-19 survivors face multifarious health problems. Although the nature of the disease and its long terms effects still require further research, various system involvement including respiratory, cardiac, neurological, muscular systems has been well highlighted by scientific researches (6,7,8). Musculoskeletal system affected by acute peripheral and respiratory skeletal muscle dysfunction accompanied by polyneuropathy and myopathy (8). These activations together result in decreased muscle strength, limited physical activity, impaired functional performance. As a consequence, COVID-19 survivors may suffer from poor quality of life.

Especially the patients who had received the treatment in an intensive care unit have a greater risk of long-term complications. Patients with older age than 65 years old, with comorbidities, having more than 7 days' length of stay in the intensive care unit, and history of mechanic ventilation are considered to be major risk factors related

to disability and poor quality of life. Besides complications related to coronavirus itself, a physically inactive period due to symptoms of the disease and lockdown may also influence the functional capacities of COVID-19 survivors negatively. It would lead to obstructions in engaging with previous activities of daily living (9).

Exercise treatment is one of the novel approaches to support individuals with loss of functional capacities, having limitations in activities of daily living (10). Quality of life and health behavior of the patients with COVID-19 would be improved by restoring disturbed functions due to coronavirus infection through physiotherapy interventions. However, there is limited access to physiotherapy and rehabilitation services during pandemic conditions because of lockdown, especially for infected patients. For increasing accessibility to physiotherapy and rehabilitation care, the World Confederation of Physical Therapy has published a report advising interventions via home-based exercise programs with telerehabilitation (11). Home-based exercise programs have been proven to be cost-effective and significantly increase the functional capacities of individuals regardless of coronavirus influence in a 4–6-week timeframe (12). Exercise will also help them to recover chronic stress associated with the pandemic disease. All these mentioned parameters together would support the improvement in the immune system of the COVID-19 survivors (13).

Although exercise training is one of the fundamental treatment approaches in improving the quality of life of COVID-19 survivors up to date there is limited published framework for a structured exercise program in the COVID-19 (14, 15).

Since the individual difference in functional levels and possible difference in the severity of coronavirus infection, COVID-19 survivors should be assessed individually before prescribing an exercise program via telerehabilitation. The eligible patients should be well-identified, all risk should be eliminated and a proper exercise program should be developed according to functional levels.

This document suggests a framework for physical therapists to put into practice an exercise training via telerehabilitation in COVID-19 survivors. The proposed framework has consisted of determination of eligible and risky COVID-19 patients for telerehabilitation intervention, physiotherapy assessment tools via telerehabilitation, 6-week exercise prescription based on FIIT-VP principle (frequency, intensity, time, type, volume, and progression) and criteria for ending exercise.

2.METHODS

This framework was suggested by searching reviews and original articles conducted in “Exercise and COVID-19” and “Exercise and Telerehabilitation” and in combination of both keywords in PubMed database.

3.RESULTS

3.1.Exercise Prescription Via Tele Rehabilitation for COVID-19 Survivors

3.1.1. The eligible COVID-19 survivors for exercise program via telerehabilitation

Expert opinion advises that patients with COVID-19 diagnosis should complete their medical treatment 14 days before participating in any exercise program (16).

3.1.2. Risky groups for participating exercise via telerehabilitation in COVID-19

Patients who were hemodynamically unstable and have percutaneous oxygen saturation (SaO₂) <95%, fever ≥38°, stage 4 chronic kidney disease or need for dialysis, dyspnea > 3/10 (according to BORG scale), fatigue level > 3/10 (BORG scale), unstable blood pressure (blood pressure > 140/90 mmHg or <90/60 mmHg), Stage 3-4 heart disease (according to the New York Heart Association), congestive heart failure, myocarditis, ventricular arrhythmia, ischemic/hemorrhagic stroke, pulmonary arterial hypertension, presence of neurodegenerative disease, increased risk for deep venous thrombosis or history for deep venous thrombosis, transplantation history, receiving immunosuppressive therapy, widespread malignancy, Mini-Mental State Examination (MMSE) score <24, advanced level of osteoporosis and fracture, being pregnant may not suitable for exercise program via telerehabilitation (17,18).

3.2.Designing an Exercise program via Telerehabilitation for COVID-19 survivors

3.2.1. Online Assessments

Online assessments must be performed via easy, short, and simple assessment tools before participating in any exercise program. Table 1 suggests sample assessments that can be performed before prescribing an exercise program for COVID-19 survivors. These assessments include testing vital signs, physical activity level, exercise capacity, cardiopulmonary endurance, lower extremity functional muscle strength, depression, and anxiety level measurements.

Table 1. Online Assessment Tools

Vital signs: Heart rate, Blood pressure, Respiratory Rate, Fever
Functional Exercise Capacity Tests
2 Minute Walking Test
10 Meter Walking Test
Time Up Go (TUG) test
Sit to Stand Test (Lower extremity functional strength)
Questionnaires
International Physical Activity Questionnaire – Short Form
EuroQoL-5D (EQ-5D)
Self-Anxiety Scale (1-4)
Self-Depression Scale (1-4)

3.2.2. Criteria for ending exercise

Exercise sessions via telerehabilitation must be ended in case of an increase in heart rate above 85% of the predictive value, reduction in systolic blood pressure more than 20 mmHg, decrease in percutaneous oxygen saturation (SaO₂) <93%, increase in breathing frequency > 30 breaths/ min, increased dyspnea, the onset of fatigue and pain, bradycardia, severe shortness of breath and feeling dizziness or lightheadedness, nausea or feeling sick, clamminess or sweating, chest tightness. Patients should be informed about these criteria and physiotherapists must be aware of checking these symptoms regularly (19).

3.2.3. Exercise Prescription

COVID-19 survivors have a different course of the disease since the virus can affect multiple systems in the body differently according to individual differences such as having comorbidity, smoking, and exercise habit and older age. Various effects of the virus may cause the COVID-19 survivors to have different exercise capacities following the infection.

Therefore, the classification of the patients according to their exercise capacity is an important approach before prescribing an exercise program. The Borg Scale is one of mostly used tool to measure overall exertion during physical activity. It is widely used to quantify perceived symptoms such as breathlessness and muscle fatigue during exercise (20).

It is suggested by the current paper to classify COVID-19 survivors into three categories such as being a sedentary or trained individual before COVID-19 diagnosis or being elder. Exercise capacity of individuals for both aerobic and resistance training are defined according to the modified Borg Scale (10 points) Baseline measurements would guide prescription of exercise program via telerehabilitation.

Six-week (three non-sequential exercise days per week) aerobic and resistance exercise program via Telerehabilitation is proposed according to the FITT-VP principle (Table 2 and Table 3). Stretching exercises are also included in the exercise design in the scope of warm-up and cool-down periods (21-23).

Table 2. Aerobic Exercise Program for COVID-19 survivors

Aerobic Exercise Training	Sedentary	Trained	Elderly
Intensity / Severity	Low (Borg 1-3) Moderate (Borg 3-5) High (Borg 5-8)	Low (Borg 1-3) Moderate (Borg 4-6) High (Borg 6-10)	Low (Borg 1-3) Moderate (Borg 2-4) High (Borg 3-7)
Exercise Type	Walking	Walking	Walking
Time	30-60 minute	30-60 minute	30-60 minute
Frequency	2-3 day/week	2-3 day/week	2-3 day/week
Total time per week	At least 150 minute	At least 150 minute	At least 150 minute
Progression	* Firstly increase in exercise time weekly (approximately 10%) ↓ * Secondly upgrade in intensity according to Borg Scale	* Firstly increase in exercise time weekly (approximately 10%) ↓ * Secondly upgrade in intensity according to Borg Scale	* Firstly increase in exercise time weekly (approximately 10%) ↓ * Secondly upgrade in intensity according to Borg Scale

Table 3. Resistance Exercise Program for COVID-19 survivors

Resistive Exercise Training	Sedentary	Trained	Elderly
Intensity / Severity	Extremely easy (Borg 1) Easy (Borg 2) Somewhat easy (Borg 3) Somewhat hard (Borg 5) Hard (Borg 7) Extremely hard (Borg 10)	Somewhat easy (Borg 3) Somewhat hard (Borg 5) Hard (Borg 7) Extremely hard (Borg 10)	Extremely easy (Borg 1) Easy (Borg 2) Somewhat easy (Borg 3) Somewhat hard (Borg 5) Hard (Borg 7)
Exercise Type: Number of Sets / Number of repetitions	Squat: 1-2 sets, 10 reps Push up: 1-2 sets, 10 reps Sit-up: 1-2 sets, 15 reps Walking lunges: 1-2 sets, 5 reps	Squat: 2-3 sets, 20 reps Push up: 2-3 sets, 20 reps Sit-up: 2-4 sets, 20 reps Walking lunges: 2-3 sets, 10 reps	Squat: 1-3 sets, 8-12 reps Push up: 1-3 sets, 8-12 reps Sit up: 1-3 sets, 8-12 reps Walking lunges: 1-2 sets, 5 reps
Frequency	2-3 days / week	2-3 days / week	1-3 days/week
Progression	Firstly, the increase in the number of repetitions, Secondly, the increase in intensity according to the Borg Scale		

4. CONCLUSION

Up to current knowledge, there is no published or suggested an exercise training framework for COVID-19 survivors. This paper would provide a sample exercise framework for physiotherapists who are willing to encourage their COVID-19 patients by means of regaining their functional capacities in their daily life. Moreover, this proposed exercise program via Telerehabilitation would also help them to overcome barriers to get face to face with their COVID-19 patients in the clinical environment during pandemic conditions.

This firstly announced exercise program via Telerehabilitation, actually at home, for COVID-19 survivors would also support public health by preventing crowded environments especially in health care centers.

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