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Original Research

Investigation of the Effects of Remote Online Exercise Training in Individuals Self-Isolating at Home Due to COVID-19 Disease: A Randomized Controlled Study

Gülşah Bargı [1,*], Ayşe Sezgi Kızılırmak Karataş [1], Elif Şahin [2]

[1] Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, İzmir Democracy University, İzmir, Türkiye
[2] Department of Physiotherapy and Rehabilitation, Institute of Health Sciences, İzmir Democracy University, İzmir, Türkiye

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Corresponding Author
Gülşah Bargı, PT, PhD
Address: Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, İzmir Democracy University, İzmir, Türkiye
E-mail: gulsahbargi35@gmail.com

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ABSTRACT

Objective: Effectiveness of a 4-week telerehabilitation program including thoracic expansion exercises (TEE), non-specific general body exercises (NSGBE), and physical activity recommendations (PAR) which started at quarantine in individuals with acute mild-COVID-19 was investigated in current study.

Methods: This is a randomized controlled study which was performed between May 2021 and February 2022. Adult individuals with acute mild-COVID-19 were randomly grouped as training (TG) (telerehabilitation program under supervision for 3 days/week) and control (CG) (home program including TEE and PAR). Dyspnea (Modified Borg Scale and Modified Medical Research Council Dyspnea Scale), chronic fatigue (Checklist Individual Strength Questionnaire), anxiety and depression (Hospital Anxiety and Depression Scale), balance (Berg Functional Balance Scale) and lower body strength (a 30-s chair stand test) were evaluated remotely in the individuals before and after a 4-week follow-up.

Results: Baseline characteristics and balance scores were similar between groups ($p>0.05$). After 4-week from baseline, there were no significant differences in dyspnea, chronic fatigue, anxiety, depression, balance, and lower body strength between the groups ($p>0.05$). However, as dyspnea, chronic fatigue, anxiety, and depression scores decreased, lower body strength increased significantly within TG after follow-up ($p<0.05$). Dyspnea, chronic fatigue, and anxiety scores decreased while lower body strength increased significantly within CG after follow-up ($p<0.05$).

Conclusion: Dyspnea, severe fatigue, anxiety, and depression are commonly observed in individuals with mild-COVID-19 in the acute period. In these individuals, dyspnea perception, chronic fatigue, anxiety, depression, and functional performance improve after a 4-week light-intensity online tele-program applied either supervised or unsupervised. Mild exercises and PAR are safe and effective in these individuals (Clinical Trial Id: ACTRN12622000121763).

Keywords: Anxiety, COVID-19, Depression, Fatigue, Physical Activity, Telerehabilitation

INTRODUCTION

Individuals with mild-SARS-CoV-2 (COVID-19) have fever, pain, cough, sore throat, and signs of nasal congestion [1,2]. Individuals with COVID-19 may also experience different symptoms including dyspnea, fatigue, muscle pain, and muscle weakness [3] since many systems and organs are directly

affected regardless of disease severity [4]. Moreover, these individuals may be exposed to sleep disturbances, decreased activity endurance, anorexia, pain disorders, and psychological dysfunctions [5]. Diaphragmatic fatigue, respiratory muscle weakness, and cardiopulmonary dysfunction may occur in these individuals due to immobilization for a long time due to COVID-19, as well [5].

In the days when the pandemic first started, approaches that increase respiratory work and distress (airway clearance techniques, thoracal expansion exercises (TEE), exercise training, respiratory muscle training, etc.) were not recommended for individuals with acute COVID-19 [1]. The rapidly increasing incidence of COVID-19 and the remarkable increase in the probability of transmission by asymptomatic carriers are important reasons of this recommendation [1]. However, as it is now known, approximately 33.2% of individuals with COVID-19 continue to experience many symptoms such as heart attack, limitations in daily living activities, and difficulties in walking, exercise, concentrate or breathing even after the illness has passed [6]. Therefore, nowadays, it is recommended to consider and change rehabilitation approaches such as physical activities, exercises, and active mobilization in these patients at the most appropriate time, based on the severity of COVID-19 and underlying chronic diseases which are also suitable for individuals with mild to moderate severity COVID-19 in the acute period [1,7]. It may be preferable to perform all these exercises at home with or without supervision through telerehabilitation (real-time video-conference technology, training videos, video calls, phone calls, etc.) to minimize COVID-19 virus contact [7-13]. Effectiveness and feasibility of telerehabilitation programs consisting of TEE, strengthening, and/or relaxation exercises in the acute and post-acute periods of COVID-19 have been confirmed by new studies [10,11,14-18]. It is seen that the duration of exercise programs conducted in the acute period of COVID-19 are during quarantine period [10-13]. On the other hand, considering that the symptoms continue for a while after the recovery of COVID-19, to reveal effectiveness of exercise training, which started in the acute period of COVID-19 and continued for the next 3 weeks, is important. Therefore, this study aimed to investigate effects of 4-week telerehabilitation program consisting of TEE, non-specific general body exercises (NSGBE), and physical activity recommendations (PAR) on dyspnea, fatigue, anxiety, depression, balance, and lower body strength in individuals with acute mild-COVID-19 at home quarantine.

Main Points;

- A 4-week comprehensive telerehabilitation program is safe and feasible in individuals with acute mild-COVID-19
- Many individuals with acute mild-COVID-19 have dyspnea, severe fatigue, anxiety, and depression.
- Telerehabilitation program including thoracic expansion exercises, physical activity recommendations and/or non-specific general body exercises has important healing effects on dyspnea perception, chronic fatigue, anxiety, and lower body strength in individuals with acute-COVID-19.
- When non-specific general body exercises were added to thoracic expansion exercises and physical activity recommendations, depression also decreased in individuals with acute-COVID-19.

MATERIALS AND METHODS

Study Design

The study was planned as a prospective, randomized, controlled, parallel and single blind (individuals with COVID-19) which was conducted at Izmir Democracy University Physiotherapy and Rehabilitation Department between May 2021 and February 2022. Eligible individuals were blinded and randomly allocated to training (TG) or control (CG) groups through a website-based randomization by GB. The individuals were started to be evaluated on the 4-6th day of quarantine by ASKK and performed exercise 7th day of the quarantine by EŞ. Measurements (ASKK) and exercises (EŞ) were performed by different physiotherapists. In line with the possibilities of the individuals, all evaluations and exercise training were performed remotely as one-to-one interview through video phone calls using WhatsApp and/or online videoconference using Microsoft teams. All individuals with mild-COVID-19 were followed-up at home as doing exercise training during 4-week by a physiotherapist. Primary outcome was anxiety. Secondary outcomes were dyspnea, fatigue, depression, balance, and functional performance. Izmir Democracy University Non-Interventional Clinical Research Ethics Committee (date: 23/03/2021, number: 2021/03-10) approved the study, that followed principles of Declaration of Helsinki. Informed consent forms were obtained from all individuals with COVID-19.

Study Population

Individuals diagnosed with acute mild-COVID-19 and followed-up at home were included between May 2021 and February 2022 and invited to participate in the study through social media and acquaintances of the researchers. Inclusion criteria were; volunteering, being adult, being able to do exercises with good cooperation, having a technological device such as smartphone, computer, iPad, or laptop, etc. where evaluations and exercises could be applied, having a positive Polymerase Chain Reaction (PCR) test result, being compatibility with COVID-19 infection as a result of chest X-ray or lung tomography despite a negative PCR test result, and being diagnosed with acute mild-COVID-19 and followed up by self-isolation at home. Exclusion criteria were; having any unstable angina pectoris, uncompensated heart failure, previous myocardial infarction, uncontrolled diabetes, hypertension above 180/110 mmHg, severe neuropathy, chronic orthopedic disorder, neurological disorders, severe psychiatric illness and/or cooperation problem that could prevent exercises, recovering from COVID-19, being pregnant, having severe muscle spasm, involuntary weight loss, and/or symptom incompatibility, or having severe dyspnea, cyanosis, and/or hemoptysis.

Exercise Training

Comprehensive telerehabilitation program containing TEE, NSGBE, and PAR was applied to TG via one-to-one online video phone call, phone voice call and/or online videoconferencing with Microsoft Teams, depending on the individuals' opportunities and availability, for 30-45 minutes/day, 3 days/week and totally 4-week. TEE consisted of a cycle of deep breathing by placing hands on lower ribs of the individual, holding breath for 3 seconds at total lung capacity, and exhaling all breathe slowly. After individuals had performed incessantly this cycle 3 times, they rested with 3-4 calm breathings all of which were repeated as 10 repetitions in a session. Individuals in TG were asked to do TEE session 4 times per a day, and one TEE session was administered under supervision in sessions held by online conference. NSGBE using body weight and/or light weights was performed under supervision for 3 days/week and 4 weeks by video calls and online video conferencing. These exercises generally consisted of general body and stretching exercises which were started from the simplest form and progressed by increasing number of repetitions and/or weights (Table 1). The PAR was recommended as 2-3 minutes of taking short walks at home every 30 minutes during the day except for sleep time. Moreover, a home program including TEE, same NSGBE and PAR was given in TG for other days of the week. Verbal confirmation at end of online sessions was used to monitor adherence to the home program in TG.

Table 1. Non-specific general body exercises

Exercise type	Repeat time, frequency, intensity, progression for each type of exercise
Supine position 1. Bridge 2. Sit-ups **Prone position** 1. Hip extension 2. Upper body extension **Crawling position** 1. Hip and knee extensions 2. Elbow extension and shoulder flexion **Standing position** 1. Squat 2. Forward lunge	**1st week:** 5 repetitions/set, 1 set/day, 7 days/week (3 days supervised), no weight. **2nd week:** 8-10 repetitions/set, 1 set/day, 7 days/week (3 days supervised), no weight. **3rd week:** 15 repetitions/set, 1 set/day, 7 days/week (3 days supervised), with 0.5-1 kg weight (water bottle, package, sandbag/dumbbell if any, etc.). **4th week:** 20 repetitions/set, 1 set/day, 7 days/week (3 days supervised), with 0.5-1 kg weight (water bottle, package, sandbag/dumbbell if any, etc.).
Sitting position 1. Hamstrings stretching **Supine position** 1. Latissimus dorsi stretching 2. Lumbar extensors stretching	**From 1st week to 4th week:** 30 second stretching, 10 second relaxing, 3 repetitions/set, 1 set/day, 7 days/week (3 days supervised).

A 4-week home program including TEE and PAR was given to CG. These individuals received only one session by phone video call and/or online videoconferencing with Microsoft Teams in a total 30-45 minutes, and the program was taught in this session. The individuals were asked to do TEE exercise for 4 times/day and every day. Moreover, same PAR was also given to these individuals. Verbal confirmation via SMS text reminders at end of every week was used to monitor adherence to the program. After 4 weeks of follow-up, it continued to be applied to CG who wants NSGBE.

Measurements

The measurement of the first individual included in the study was performed on May 1, 2021. The final measurement of the

last individual included in the study was made on February 28, 2022. A measurement session of an individual was completed within approximately 30-60 minutes, considering the fatigue level of the individual. All individuals were evaluated to measure demographic characteristics, dyspnea, chronic fatigue, anxiety and depression, balance, and lower body strength before and after 4-week follow-up. Individuals responded to all questions administered by physiotherapists during online interviews.

The demographic characteristics were recorded. Dyspnea perception was evaluated using Modified Borg Scale (MBS) and Modified Medical Research Council Dyspnea Scale (MMRCDS). The MBS is scored between 0 (no dyspnea) and 10 (extremely severe dyspnea) which shows severity of dyspnea [19]. The MMRCDS is scored between 0 (no dyspnea) and 4 (almost complete incapacity due to dyspnea) which shows presence of daily living activities [20]. Chronic fatigue perception in the last 2 weeks was assessed using Checklist Individual Strength Questionnaire [21] consisting of totally 20 statements and 4 aspects [subjective experience of fatigue (8-statement), concentration (5-statement), motivation (4-statement), and physical activity (3-statement)]. Each statement is scored as straight or reverse through a 7-point Likert scale (from 1 "yes true" to 7 "not true") [22]. Cut-off point for severe fatigue is ≥40 [23]. Anxiety and depression during past week were evaluated with Hospital Anxiety and Depression Scale [24]. Out of 14 questions, 7 measures anxiety (anxiety subscale), and 7 measures depression (depression subscale). The answers are evaluated on a four-point Likert scale and scored between 0 and 3. For each subscale, the lowest score is 0 and the highest score is 21. Cut-off scores are 10 points for anxiety and 7 points for depression subscales [25]. To evaluate balance, Berg Functional Balance Scale was used in current study containing 14 movements reflecting everyday life [26]. Each movement is scored from 0 (unable to perform) to 4 (normal performance). The highest score is 56 points which shows full postural control [27]. A 30-s chair stand test was used to determine lower body strength and functional mobility. The individual sits in a chair with no back support, arms crossed over trunk which is initial seated position. Next, the individual stands and sits consecutively for 30 seconds. Total number of correct stands during this period was recorded. The higher number of repetitions indicates better physical performance [28].

Statistical Analyses

To determine mean difference in anxiety scores (7.5) between two independent groups for an α value of 0.05, a power of 80%, at least 15 individuals were calculated for each group [14] through GPower program (G*Power 3.0.10 system, Franz Faul, Universität Kiel, Germany) [29]. Statistical analyzes were conducted using the SPSS 15.0 program. Descriptive analyzes were offered using frequency (n), percentage (%), median, interquartile range (IQR), mean (x), and standard deviation (sd). Variables between groups were compared using Mann-Whitney U and Chi-square tests. Pre- and post-program variables within each group were compared using Wilcoxon test. Difference variables of pre- and post-program values were compared using Mann-Whitney U test between groups. Effect size d (Cohen's d) values were calculated and interpreted as small (0.20), moderate (0.50) and large (>0.80) effect sizes. Post-hoc statistical powers were calculated and presented as 1-β. The probability of error was accepted as $p \leq 0.05$.

RESULTS

Out of 33 individuals with acute mild-COVID-19, 13 in TG and 7 in CG completed the study (Figure 1). None of the individuals had any balance problems before or after the program.

Before 4-week program: Dyspnea during daily living activities existed in 9 (69.2%) individuals in TG and 4 (57.1%) individuals in CG; severe fatigue was experienced by 8 (61.5%) individuals in TG and 3 (42.9%) individuals in CG; 4 (30.8%) individuals in TG had anxiety; 6 (46.2%) individuals in TG and 3 (42.9%) individuals in CG had depression (Figure 2, $p>0.05$). Baseline characteristics were similar between groups (Table 2-3, $p>0.05$).

After 4-week program: Dyspnea during daily living activities existed in 4 (30.8%) individuals in TG and 2 (28.6%) individuals in CG; severe fatigue was experienced by only 1 (7.7%) individual in TG; 2 (15.4%) individuals in TG had anxiety (Figure 2, $p>0.05$). No significant differences were found in dyspnea perception (MBS score: effect size= 0.83, 1-β=0.40) (MMRCDS score: effect size d= 0.41, 1-β=0.13), chronic fatigue (CIS total score: effect size d= 0.29, 1-β=0.09), anxiety (effect size d: 0.14, 1-β=0.06), depression (effect size d: 0.07, 1-β=0.05), balance, and lower body strength (effect size d: 0.43, 1-β=0.15) between the groups (Table 4, $p>0.05$). Within TG, dyspnea perception, chronic fatigue, anxiety, and depression scores significantly decreased while lower body strength significantly increased after 4-week (Table 4, $p<0.05$). Within CG, dyspnea, chronic fatigue, and anxiety significantly decreased as lower body strength significantly increased after 4-week (Table 4, $p<0.05$). No change occurred in balance score within both groups (Table 4, $p>0.05$).

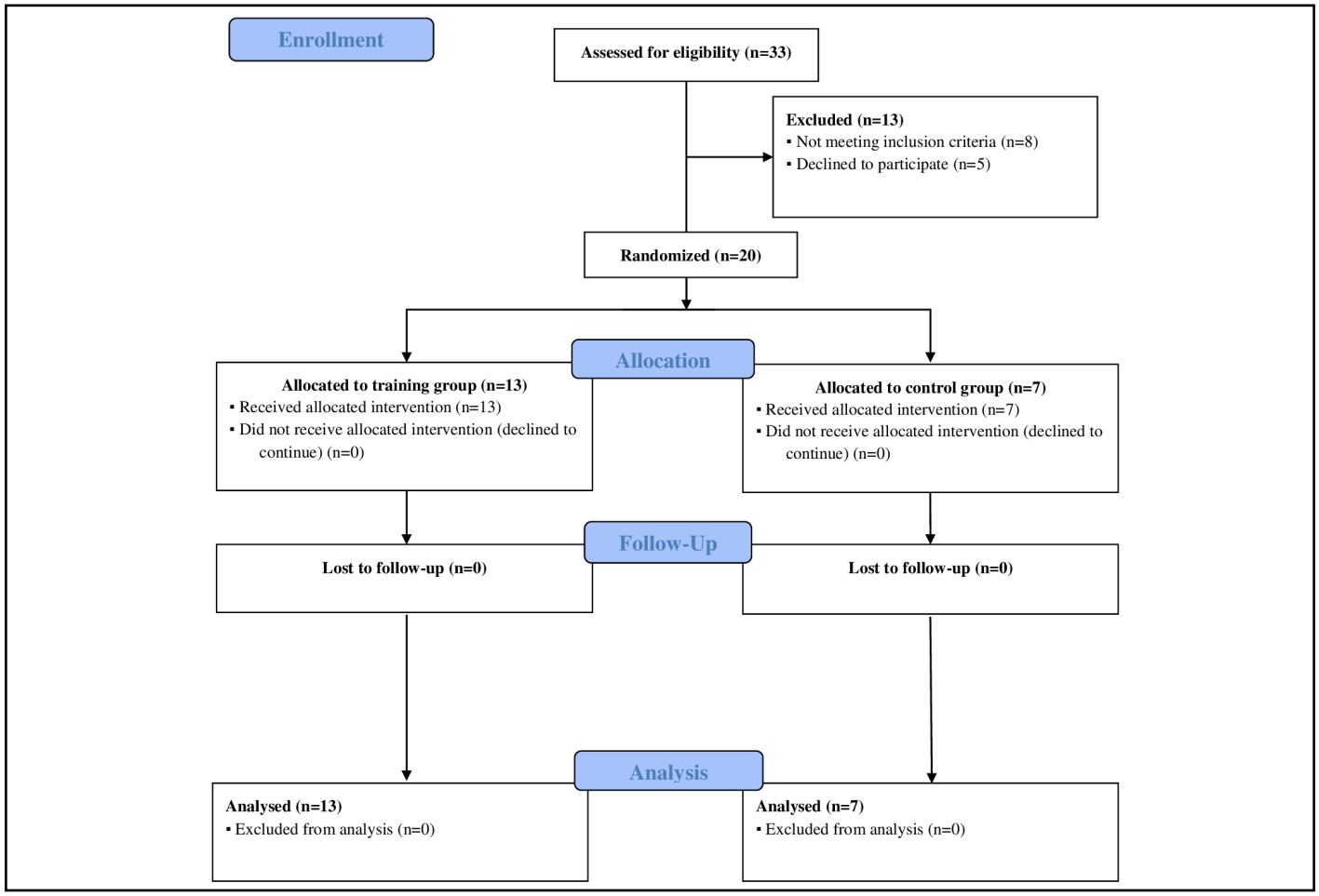

Figure 1. Consort flow diagram of the study.

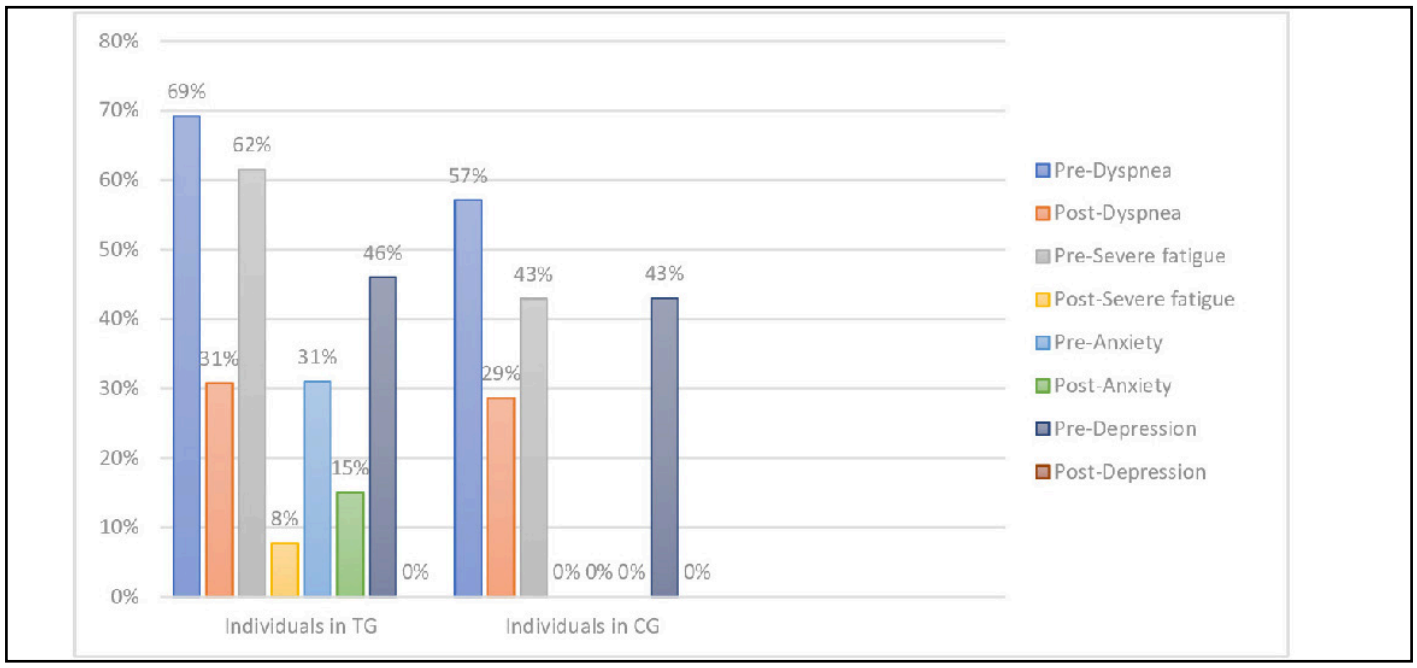

Figure 2. Pre-post-program rates of dyspnea, severe fatigue, anxiety, and depression in the groups.

Table 2. Demographic characteristics of the groups

	TG (n=13) x±sd	CG (n=7) x±sd	p value
Age (year)	31.77±5.76	29.57±7.55	0.474
Weight (kg)	58.62±8.20	75.29±25.54	0.139
Height (m)	1.68±0.09	1.72±0.14	0.440
BMI (kg/m^2)	20.86±3.19	24.88±5.94	0.062
Female (n (%))	11 (84.6%)	4 (57.1%)	0.290
Male (n (%))	2 (15.4%)	3 (42.9%)	
Presence of exercise habits (n (%))	4 (30.8%)	2 (28.6%)	1.000
Presence of chronic illness (n (%))	3 (23.1%)	2 (28.6%)	1.000

kg: kilogram, m: meter, n: frequency, %: percent, TG: training group, CG: control group, x: mean, sd: standard deviation. Chi-square test, $^{\#}p<0.05$; Mann-Whitney U test, *p<0.05.

Table 3. Comparison of the values of the groups before online program

	TG (n=13)		CG (n=7)		U value	p value
	x±sd	median (IQR)	x±sd	median (IQR)		
MBS (0-10)	1.38±1.71	1 (3)	2.43±2.07	3 (4)	32	0.267
MMRCDS (0-4)	1±0.91	1 (2)	0.71±0.76	1 (1)	38	0.523
CIS total score (20-140)	90.08±22.93	93 (22.5)	81±11.24	82 (24)	24.5	0.096
Subjective fatigue (8-56)	39.62±10.28	42 (11)	35.86±7.82	33 (17)	30.5	0.234
Concentration (5-35)	20.46±6.65	21 (8)	18.57±8.58	21 (17)	40	0.661
Motivation (4-28)	15.92±6.58	18 (11)	12.29±3.55	12 (5)	27	0.141
Physical activity (3-21)	14.08±4.15	14 (4)	14.29±3.09	15 (2)	40.5	0.687
HAD total score (0-42)	14.39±8.62	13 (5.5)	9.57±5.19	8 (9)	30	0.217
Anxiety (0-21)	8±5.87	8 (7)	4.43±2.51	4 (4)	26	0.120
Depression (0-21)	6.38±4.37	5 (9)	5.14±2.85	4 (6)	37.5	0.524
Berg Balance Scale (0-56)	56	56	56	56	45.5	1.000
30-s chair stand test (n)	14±3.61	14 (5)	13.29±4.19	11 (4)	35	0.402

MBS: Modified Borg scale, MMRCDS: Modified Medical Research Council Dyspnea scale, CIS: Checklist Individual Strength questionnaire, HAD: Hospital Anxiety and Depression scale, n: frequency, TG: training group, CG: control group, x: mean, sd: standard deviation, IQR: Interquartile range. Mann-Whitney U test, *p<0.05.

Table 4. Comparison of the values of the groups before and after program

	TG (n=13)			CG (n=7)			Between groups p value
	Before program	After program	Within-groups p value	Before program	After program	Within-groups p value	
	x±sd median (IQR)	x±sd median (IQR)		x±sd median (IQR)	x±sd median (IQR)		
MBS (0-10)	1.38±1.71 1 (3)	0.77±1.09 0 (2)	0.121	2.43±2.07 3 (4)	0.43±0.79 0 (1)	#**0.042**	0.084
MMRCDS (0-4)	1±0.91 1 (2)	0.31±0.48 0 (1)	#**0.014**	0.71±0.76 1 (1)	0.29±0.49 0 (1)	0.083	0.482
CIS total score (20-140)	90.08±22.93 93 (22.5)	44.31±20.04 39 (30)	#**0.002**	81±11.24 82 (24)	28.71±11.56 20 (18)	#**0.018**	0.721
Subjective fatigue (8-56)	39.62±10.28 42 (11)	18.31±10.55 16 (13)	#**0.002**	35.86±7.82 33 (17)	11.71±4.92 8 (7)	#**0.018**	0.781
Concentration (5-35)	20.46±6.65 21 (8)	12.69±6.16 11 (10)	#**0.003**	18.57±8.58 21 (17)	7.71±3.64 5 (5)	#**0.043**	0.525
Motivation (4-28)	15.92±6.58 18 (11)	7.15±2.61 6 (5)	#**0.002**	12.29±3.55 12 (5)	5±1.29 4 (2)	#**0.018**	0.605
Physical activity (3-21)	14.08±4.15 14 (4)	6.15±3.6 5 (4)	#**0.004**	14.29±3.09 15 (2)	4.29±1.89 3 (4)	#**0.018**	0.551
HAD total score (0-42)	14.39±8.62 13 (5.5)	7.31±4.85 8 (8.5)	#**0.008**	9.57±5.19 8 (9)	2.29±2.81 1 (5)	#**0.034**	0.842
Anxiety (0-21)	8±5.87 8 (7)	5.23±3.52 5 (6)	#**0.045**	4.43±2.51 4 (4)	1.14±2.27 0 (2)	#**0.042**	0.605
Depression (0-21)	6.38±4.37 5 (9)	2.08±1.75 2 (3)	#**0.003**	5.14±2.85 4 (6)	1.14±1.35 1 (3)	0.062	0.937
Berg Balance Scale (0-56)	56	56	1.000	56	56	1.000	1.000
30-s chair stand test (n)	14±3.61 14 (5)	15.85±3.05 16 (5)	#**0.054**	13.29±4.19 11 (4)	16.14±3.85 15 (4)	#**0.014**	0.372

MBS: Modified Borg scale, MMRCDS: Modified Medical Research Council Dyspnea scale, CIS: Checklist Individual Strength questionnaire, HAD: Hospital Anxiety and Depression scale, n: frequency, TG: training group, CG: control group, x: mean, sd: standard deviation, IQR: Interquartile range. Wilcoxon test, #p<0.05; Mann-Whitney U test, *p<0.05.

DISCUSSION

A 4-week safe and feasible comprehensive telerehabilitation program were applied to individuals self-isolating at home due to acute mild-COVID-19 in this preliminary randomized controlled study which is the first study conducted during acute and subacute period of mild-COVID-19, to our knowledge. Before this program, while dyspnea, severe fatigue, anxiety, and depression existed in many individuals with acute COVID-19, balance problem was not observed in these individuals. After the program, while dyspnea, severe fatigue, and anxiety continued to be observed in some individuals, the individuals had no depression and balance problem. This tele-program has considerably healing effects on dyspnea perception with moderate-large effect size, chronic fatigue, anxiety, and lower body strength in individuals with acute-COVID-19 regardless of the practice of NSGBE. When NSGBE were added to telerehabilitation program, depression also decreased in the individuals. No complications were observed secondary to the exercises.

Healing effects of various rehabilitation approaches such as pulmonary rehabilitation, telerehabilitation, progressive muscle relaxation, low-intensity aerobic exercises, strengthening

exercise, and cognitive behavioral therapy on pulmonary function, muscle strength, exercise capacity, Kinesio phobia, fatigue, mood, sleep quality and/or quality of life are still being revealed in individuals with COVID-19 at the acute or post-acute periods [10,11,14-18]. In line with our results, healing effects of TEE and strength exercises applied as 14-day telerehabilitation versus a CG on fatigue, dyspnea, exercise capacity, and lower body strength were revealed in individuals with acute mild-COVID-19 [10]. Moreover, improvements in dyspnea and exercise capacity were more pronounced in TEE group and no complication after exercise programs was found [10]. Therefore, Rodríguez-Blanco et al. recommend combining TEE and strength exercises for the management of these patients, as conducted in our study [10]. Liu et al. also investigated 5-day effectiveness of progressive muscle relaxation and deep breathing exercises (Jacobson's relaxation techniques, 20-30 min/day, 5 consecutive days) versus a CG on anxiety and sleep quality in patients with acute-COVID-19 isolated at hospital [11]. After training, anxiety and sleep quality considerably improved in exercise group compared to controls in parallel with our results [11]. In another study of Rodriguez-Blanco et al., feasibility and effectiveness of a 1-week therapeutic muscle conditioning exercise through telerehabilitation versus a CG on exercise capacity, dyspnea, and lower body strength in patients with acute mild to moderate-COVID-19 were searched [12]. In consistent with our results, this program including muscle toning exercise is effective, safe, and feasible in patients with acute COVID-19 isolating at home or hospital, which improves all parameters with a good patient adherence (90%) compared to the CG [12]. Gonzalez-Gerez et al. exposed same effectiveness of 1-week pulmonary rehabilitation based on TEE through telerehabilitation versus a CG on same outcomes in these patients [13]. Since individuals in CG did not receive exercise in these studies [10-13], the difference in TG might have been determined better compared to CG inconsistent with our results. On the other hand, these studies [10-13] have been consistently verified effectiveness and feasibility of various online remote exercise trainings consisting of TEE, strengthening, and/or relaxation exercises in the acute period of COVID-19 regardless of exercise duration. The superiority of our study compared to these studies was that both longer exercise duration (starting from the quarantine period and completing at the end of a 4-week follow-up) and application of more comprehensive exercises to both groups. Moreover, in current study, our individuals in TG were followed-up in one-to-one sessions for 3 days/week and totally 4-week unlike other studies [10-13]. However, we could not reach targeted sample size due to constantly changing number of quarantine days and rules. The quarantine period, which was previously 14 days for close contacts of COVID-19 patients, was updated to 10 days. Now this period has been reduced to 5 days even further. As all these changes directly affected the methodology of our study, we could not continue the study. Ultimately, although differences between TG and CG were not shown in our study, our study is of great importance in terms of demonstrating safe and effective applicability of more comprehensive remote online exercises and physical activities beginning in the acute phase of COVID-19 and continuing in the subacute phase. In the light of all these findings, we suggest investigating effects of long-term programs that start in the acute phase of COVID-19 and continue in the subacute/chronic phase on long follow-up periods.

Limitations

Our main limitation is that we could not reach a sufficient sample size due to reduction of the severe adverse effects of COVID-19 over time, and/or the continuous change of the COVID-19 quarantine rules from May 2021 to February 2022. Therefore, we could not obtain effectively more positive changes in dyspnea, fatigue, mood, and lower body strength demonstrating the superiority of TG in the current study. Future work should be planned with this in mind.

CONCLUSIONS

Following 4-week supervised telerehabilitation program, important improvements experienced by individuals with acute mild-COVID-19 self-isolating at home are reductions in dyspnea perception, chronic fatigue, anxiety, and/or depression and better functional performance. Moreover, when the exercises including TEE and PAR are applied as a home program in individuals with acute mild-COVID-19 who cannot follow a strictly supervised rehabilitation program, same improvements excluding decreased depression are seen in these individuals. Mild severity telerehabilitation program, TEE and PAR are safe and effective in individuals with mild-COVID-19.

Acknowledgments: This study was presented as an oral presentation at the 1st International / 4th National Health Services Congress held in Isparta on 10-12 June 2022.

Conflict of interest: It is declared that there is no conflict of interest in current study.

Informed Consent: Informed consents from all individuals were obtained.

Funding: None.

Ethical Approval: The ethical approval (Izmir Democracy University Non-Interventional Clinical Research of the Ethics Committee, date: 23/03/2021, number: 2021/03-10) existed.

Author Contributions: Conception: GB, ASKK - Design: GB, ASKK - Supervision: GB - Fundings: GB -Materials: GB, ASKK - Data Collection and/or Processing: GB, ASKK, EŞ - Analysis and/or Interpretation: GB - Literature: GB, ASKK - Review: GB, ASKK, EŞ - Writing: GB, ASKK, EŞ - Critical Review: GB, ASKK, EŞ.

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