Fenerbahce University
Journal of Health Sciences
Volume 5, Issue 3, 329-344, 2025

Fenerbahçe Üniversitesi
Sağlık Bilimleri Dergisi
Cilt 5, Sayı 3, 329-344, 2025

FBU-JOHS

Investigation of the Effects of Supervised Exercise-Based Telerehabilitation Program on Respiration, Quality of Life, Physical Activity, and Fatigue in Individuals with COVID-19: Randomized Controlled Trial

COVID-19'lu Bireylerde Gözetimli Egzersiz Tabanlı Telerehabilitasyon Programının Solunum, Yaşam Kalitesi, Fiziksel Aktivite ve Yorgunluk Üzerindeki Etkilerinin Araştırılması: Randomize Kontrollü Çalışma

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Abstract

The aim of this study was to determine the effects of telerehabilitation-based exercise programs on respiratory function, quality of life (QoL), physical activity, and fatigue in individuals diagnosed with COVID-19 and recovered. Fifty participants, diagnosed with and recovered from COVID-19, were divided into two groups: Participants in Group 1 followed an online supervised exercise program twice a week for six weeks, while participants in Group 2 performed the same exercises using an exercise brochure sent to them and were monitored for compliance through weekly phone calls. Socio-demographic data and various assessments (Dyspnea Scale, International Physical Activity Questionnaire-Short Form, St. George Respiratory Questionnaire, Nottingham Health Profile, and Fatigue Severity Scale) were collected before and after the intervention. Pre-treatment measurements showed no significant difference between the groups ($p > 0.05$). After the treatment, a significant difference was observed only in the COVID-19 Fear Scale ($p=0.030$). When measurements within each group were compared, significant improvements were observed across all assessments ($p < 0.05$). Upon reviewing the literature, although there are studies on the effects of telerehabilitation-based physiotherapy in individuals diagnosed with and recovered from COVID-19, no study was found that directly compares the results of these two telerehabilitation approaches (online supervised and follow-up). This study demonstrates that both telerehabilitation methods have positive effects on participants and offer new perspectives to the literature.

Keywords: COVID-19, physical activity, quality of life, respiratory system, telerehabilitation

Özet

Bu çalışmanın amacı, COVID-19 tanısı alan ve iyileşen bireylerde telerehabilitasyon tabanlı egzersiz programlarının solunum fonksiyonu, yaşam kalitesi, fiziksel aktivite ve yorgunluk üzerindeki etkisini belirlemektir. COVID-19 tanısı alan ve iyileşen elli katılımcı iki gruba ayrıldı: Grup 1 katılımcılarına, altı hafta boyunca haftada iki kez çevrimiçi olarak denetlenen egzersiz programı uygulanırken, Grup 2 katılımcılarına aynı egzersizler, onlara gönderilen egzersiz broşürü aracılığıyla uygulandı ve haftalık telefon görüşmeleri ile yapıp yapmadıkları kontrol edildi. Müdahaleden önce ve sonra sosyo-demografik veriler ve çeşitli değerlendirmeler (Dispne Ölçeği, Uluslararası Fiziksel Aktivite Anketi-Kısa Form, St. George Solunum Anketi, Nottingham Sağlık Profili, COVID-19 Korku Ölçeği ve Yorgunluk Şiddeti Ölçeği) yapıldı. Tedavi öncesindeki ölçüm sonuçları gruplar arasında anlamlı bir farklılık göstermedi ($p > 0,05$).

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DOI: 10.56061/fbujohs.1628881
RESEARCH ARTICLE

Tedavi sonrası, yalnızca COVID-19 Korku Ölçeği'nde anlamlı bir fark gözlendi (p=0,030). Her grup içindeki ölçümler karşılaştırıldığında, tüm değerlendirmelerde anlamlı iyileşmeler saptandı (p < 0,05). Literatür incelendiğinde, COVID-19 tanısı alan ve iyileşen bireylerde telerehabilitasyon tabanlı fizyoterapinin etkileri üzerine çalışmalar olmakla birlikte, bu iki telerehabilitasyon yaklaşımının (çevrimiçi gözetimli ve takip) sonuçlarını doğrudan karşılaştıran çalışmaya rastlanılmadı. Bu çalışma, her iki telerehabilitasyon yönteminin de katılımcılar üzerinde pozitif etkiler oluşturduğunu ve literatüre yeni bakış açıları sağladığını göstermektedir.
Anahtar Kelimeler: COVID-19, fiziksel aktivite, solunum sistemi, telerehabilitasyon, yaşam kalitesi

How to cite (atıf için): Demircan, E. N., Bostan, A., Khakzad, M., Uncuk, E., Kızıl, D., Adıyaman, G., Dağ, E. S. & Köse, N.., (2025). Investigation of the effects of supervised exercise-based telerehabilitation program on respiration, quality of life, physical activity, and fatigue in individuals with covid-19. Fenerbahçe University Journal of Health Sciences,5(3), 329-344. DOI: 10.56061/fbujohs.1628881

Submission Date: 25.03.2025, Acceptance Date: 29.09.2025, Publication Date: 31.12.2025

1. Introduction

Coronavirus disease (COVID-19) is a respiratory illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Ahmad & Rathore, 2020). This virus, which is transmitted from person to person by direct contact or respiratory secretion, differs from other respiratory viruses in that the symptoms appear approximately 2 to 10 days after exposure to the virus (Guan et al., 2020; MS, 2020). The pandemic and the measures that came with it have caused individuals to go beyond the norm in their daily lives. In particular, the extended period of staying at home has negatively affected individuals in many ways (Uğur et al., 2023).

Patients who have contracted COVID-19 need health support in many ways during and after the disease, and prioritization has been given to them within the health system (Kodama et al., 2013; Polastri et al., 2020). After discharge, symptoms such as fatigue, anxiety, dysphagia, pulmonary function impairments, and respiratory problems; activities of daily living, quality of life (QoL), and exercise levels in individuals should be evaluated in the early period, and appropriate exercise training should be given (Polastri et al., 2020). In studies on physical activity, it was reported that physical activity strengthens the immune system, has positive effects on general physical capacity, increases mental health, and reduces stress, depression, and anxiety (Kodama et al., 2013). As a result of the restrictions that came with the COVID-19 pandemic, the level of physical activity has decreased significantly and caused adverse health consequences (Booth et al., 2012; Booth et al., 2017).

Since COVID-19 often causes pulmonary involvement and respiratory problems, the importance of pulmonary rehabilitation has increased during this period. The aims of pulmonary rehabilitation comprise reduction of dyspnea symptoms, maintenance and/or improvement of physical function, improvement of QoL, improving respiratory functions, preventing complications that may occur due to long-term immobilization, and reducing health-related expenditures by reversing or stabilizing the systemic effects of the disease (Güzel & Başaran, 2020; Ries et al., 2007; Serpil, 2020; Spruit, 2014).

Telerehabilitation, defined as ‘the use of digital technologies and communication tools to provide online rehabilitation services’, enables rehabilitation to be both accessible and more efficient for people with long-term rehabilitation needs (Kairy et al., 2009). Some health institutions have switched to

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DOI: 10.56061/fbujohs.1628881
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telerehabilitation for chronic pulmonary rehabilitation and heart diseases. Individuals receive treatment through online platforms from the healthcare professional they want to consult (for example, a physiotherapist) from their homes using technological tools such as tablets, smartphones, and computers (Bryant et al., 2020).

Home-based physical activity programs are vital for strengthening the immune system, which is extremely important in COVID-19 management, and to protect physical and mental health (Kanik, 2020; Tunç et al., 2020). Besides, since pulmonary rehabilitation sessions involve a high risk of transmission, it is recommended to use applications such as single-session training, telerehabilitation, and home programs (Güzel & Başaran, 2020; Liu et al., 2020). Studies indicate that telerehabilitation applications have many benefits, such as increasing the QoL and physical activity (Wijkstra, 1996). In addition to these benefits, telerehabilitation applications are of great importance throughout the COVID-19 period due to their complementary nature.

After the COVID-19 outbreak, the telerehabilitation method became widely adopted as a treatment method to protect healthcare workers and patients from risks across the country (Prvu Bettger & Resnik, 2020). Rehabilitation methods changed radically and suddenly with the adoption of telehealth by physiotherapists in many settings (Association, 2020). Although there are studies in the literature emphasizing the importance of telerehabilitation during the COVID-19 period, no studies have investigated the effects of an online exercise program conducted under the supervision of a physiotherapist, along with the follow-up of individuals' exercises using the provided exercise brochure. The aim of the study is to examine the effects of different telerehabilitation methods on respiration, quality of life, physical activity, and fatigue in individuals with COVID-19.

2. Method

2.1. Purpose of the Research

This study aims to investigate the impact of telerehabilitation-based exercise training on respiratory function, QoL, physical activity, and fatigue in individuals diagnosed with and recovered from COVID-19.

2.2. Questions of the Research

In the study:

• Is online supervised exercise training effective in improving respiratory, QoL, physical activity, and fatigue parameters in individuals who were diagnosed with and recovered from COVID-19?

• Is the telerehabilitation method with follow-up supervision effective on respiratory, QoL, physical activity, and fatigue parameters in individuals who were diagnosed with and recovered from COVID-19?

• Are the effects of an online supervised exercise training and a follow-up method on respiratory, QoL, physical activity, and fatigue parameters the same in individuals who were diagnosed with and recovered from COVID-19?

2.3. Universe and Sample of the Research

A sample size was calculated using the program G*Power 3.1.9.2. It was determined according to power analysis performed with an effect size of 0.8, a 0.05 significance level, and 85% power, and it was estimated as a minimum of 50 patients, with 25 in each group (Faul et al., 2007).

The study included voluntary participants aged 18 to 65 who were diagnosed with and recovered from COVID-19, confirmed by a positive Polymerase Chain Reaction (PCR) test. The participants were required to score between 1 and 3 on the Medical Research Council (MRC) Dyspnea Scale, be non-sedentary (as determined by the International Physical Activity Questionnaire-Short Form, IPAQ-SF), and be capable of cooperating with the study's requirements. The study included voluntary participants aged 18–65 who had previously tested positive for COVID-19 by Polymerase Chain Reaction (PCR) and subsequently recovered. Eligible participants also had a Medical Research Council (MRC) Dyspnea Scale score between 1 and 3, were classified as non-sedentary according to the International Physical Activity Questionnaire–Short Form (IPAQ-SF) and were able to comply with the study procedures. Participants were excluded if they met any of the following conditions:

- Receiving intensive care treatment due to COVID-19
- Having a diagnosis of progressive respiratory disease
- Presence of neuromuscular or neurological disorders
- Vestibular or orthopedic conditions affecting balance
- Psychiatric or cognitive disorders
- Cardiopulmonary problems or other systemic diseases
- History of cancer within the past five years
- Balance or coordination impairments
- Lack of internet access
- Deep vein thrombosis or pulmonary embolism
- Any condition in which exercise is contraindicated
- Ongoing infection symptoms
- History of surgery within the previous 6 months involving the spinal column or the upper/lower extremities that could influence the musculoskeletal system

2.4. Data Collection and Data Tools

First, a preliminary evaluation was conducted via video call before the treatment to determine the rehabilitation needs of the patients. Initially, the demographic characteristics (sex, age, height, and weight), education status, occupation, and disease information about COVID-19 of the participants in both groups were recorded. In addition, the MRC Dyspnea Scale was used to assess the participants' dyspnea levels at the start of their treatment. Each assessment session (both pre- and post-treatment) was performed by the same investigator and lasted approximately 30–35 minutes.

2.4.1. MRC Dyspnea Scale

This is a five-point scale consisting of five items based on various physical exercises that cause dyspnea. The person's respiratory distress is graded from 1 (no shortness of breath) to 5 (being housebound with shortness of breath during activities such as dressing) (Bestall et al., 1999).

The Fear of COVID-19 Scale

The participants' fear levels related to COVID-19 were assessed using the Fear of COVID-19 Scale (Ahorsu et al., 2020). This scale consists of 7 items; each rated on a 5-point Likert scale. The total score can range from 7 to 35, with higher scores reflecting greater fear of COVID-19 (Satici et al., 2020). The scale was translated and adapted into Turkish (Satici et al., 2020), with a cut-off score of 16.5 established (Nikopoulou et al., 2020).

2.4.2. Physical Activity Level

The participants' physical activity levels were assessed using the IPAQ-SF, which has been validated and confirmed as reliable in Turkiye. The survey consists of 7 questions. It provides information about walking, sitting, and moderate and vigorous intensity activities in the last 7 days. The energy used in activities is calculated as Metabolic Equivalent of Task (MET)-minutes/week by multiplying the day, minutes, and MET value. The individuals' physical activity levels are divided into three categories according to the scores obtained: "inactive", "minimally active", and "very active" (Saglam et al., 2010).

2.4.3. Quality of Life

The QoL of individuals was evaluated with the St. George's Respiratory Questionnaire (SGRQ), which was confirmed to be valid and reliable in Turkiye (Polatlı et al., 2013). SGRQ has three sub-sections, namely symptoms (8 items), activities (16 items), and effects of the disease (26 items), and consists of a total of 50 items. The total score of the test is between 0 and 100. A higher score indicates a greater impairment in health status (Ferrer et al., 1996).

2.4.4. The Nottingham Health Profile

The Nottingham Health Profile (NHP), which was translated and adapted into Turkish, was also utilized to assess the participants' health-related QoL. The NHP is a comprehensive QoL questionnaire that evaluates an individual’s perceived health issues and the extent to which these issues affect their daily functioning. The first section of the NHP, consisting of 38 items, assesses six key health parameters: energy (3 items), pain (8 items), emotional reactions (9 items), sleep (5 items), social isolation (5 items), and physical activity (8 items). Each parameter is scored on a scale from 0 to 100, where 0 represents the best health and 100 represents the worst health. In the second part of the scale, yes/no answers indicate whether the work, sexual life, home life, housework, social life, holidays, and hobbies of the individuals are affected by the disease (Kücükdeveci et al., 2000).

2.4.5. Fatigue Severity

To assess the severity of fatigue, the Turkish version of the Fatigue Severity Scale (FSS), which has been validated and proven reliable, was used. The scale evaluates the intensity of fatigue experienced over the past week and consists of nine questions; each rated on a seven-point scale. The total score

can range from 9 to 63 points. High scores indicate greater fatigue severity, with 28 points and above indicating severe fatigue (Gencay-Can & Can, 2012).

The participants were split into two groups: Group 1 (G1) (online supervised) and Group 2 (G2) (the follow-up). All assessments were conducted online twice, pre- and post-treatment.

Interventions

The exercises were performed by the individuals in G1 via telerehabilitation (supervised online) in the presence of a physiotherapist twice a week. On days without exercise with a physiotherapist, they performed the exercises independently. The same exercises were sent as an exercise brochure to the G2, and phone contacts were applied once a week for the follow-up. They were instructed to perform the exercises in the brochure at home every day. The exercise program of individuals in both G1 and G2 was planned as a moderate intensity program, lasting 30-35 minutes per session, for 6 weeks. The telerehabilitation program included personalized recommendations tailored to each patient's needs, starting with low intensity and duration, and gradually increasing them. The program was continuously adjusted based on previous evaluations and the individual requirements of each patient.

Exercise therapy

Exercise sessions included breathing exercises, strengthening the upper and lower body muscles, and aerobic training. Respiratory training included “pursed lip” breathing performed independently or during rest periods between other exercises. Strength exercises were also added to the program in subsequent sessions. Upper and lower body strength training materials were found in the participants’ home environment (bottled water and a chair). Aerobic training included walking in place and walking around a room. The program continued with outdoor walking over time, depending on the participants’ ability to do so. The resistance level, as well as the total number of sets and repetitions for the exercises in the treatment program, were adjusted based on each individual's needs. The participants were given a brochure summarizing the exercises performed. The individuals were encouraged to refer to the brochure to perform exercises independently. (Lei et al., 2021; Turan et al., 2021).

2.5. Ethical Aspects of the Research

The approval for the study was granted by the Non-Invasive Research Ethics Committee of Ethics Committee of Istanbul Rumeli University on 01.12.2021, Meeting No: 2021/10, Item No: 10. The study protocol was registered at ClinicalTrials.gov (Identifier: NCT05305638).

2.6. Limitations of the Research

No problems were observed among the participants throughout the treatment program. The limitation of this study is that all evaluations were carried out online. Another limitation was that the long-term effects of telerehabilitation were not examined. It is recommended that future studies investigate the long-term effects of telerehabilitation on participants.

2.7. Analysis and Evaluation of Data

All statistical analyses were conducted using IBM SPSS 22.0 (SPSS, Inc., Chicago, IL, USA). Statistical significance was accepted as $p < 0.05$. Descriptive statistics (frequency, mean, and standard deviation)

were calculated to define the sample. The data normality was checked with the Shapiro-Wilk test. Demographic differences between groups were analyzed using the Independent Samples t-test for continuous variables and the Chi-square test for categorical variables.

Intra-group differences in MRC Dyspnea Scale, COVID-19 Fear Scale, Physical Activity Levels, QoL, and the FSS scores before and after treatment were analyzed using the Wilcoxon signed-rank test, while group differences were evaluated with the Mann–Whitney U test.

Wilcoxon signed-rank test and Mann–Whitney U test effect size (r) were calculated for within-group and between groups based on estimated means. Effect size was interpreted as large (0.5), medium (0.3), and small (0.1).

3. Results

Fifty-eight participants, who were diagnosed with and recovered from COVID-19, were screened for eligibility, and fifty people met the inclusion criteria. The participants were randomized and assigned to G1 (n = 25) or G2 (n = 25) (Figure 1).

The demographic characteristics of the groups are shown in Table 1. No significant difference was observed between G1 and G2 in the baseline outcome measures such as age, sex, marital status, active employment, and education status, smoking and alcohol use, and the presence of date of catching COVID-19 ($p > 0.05$).

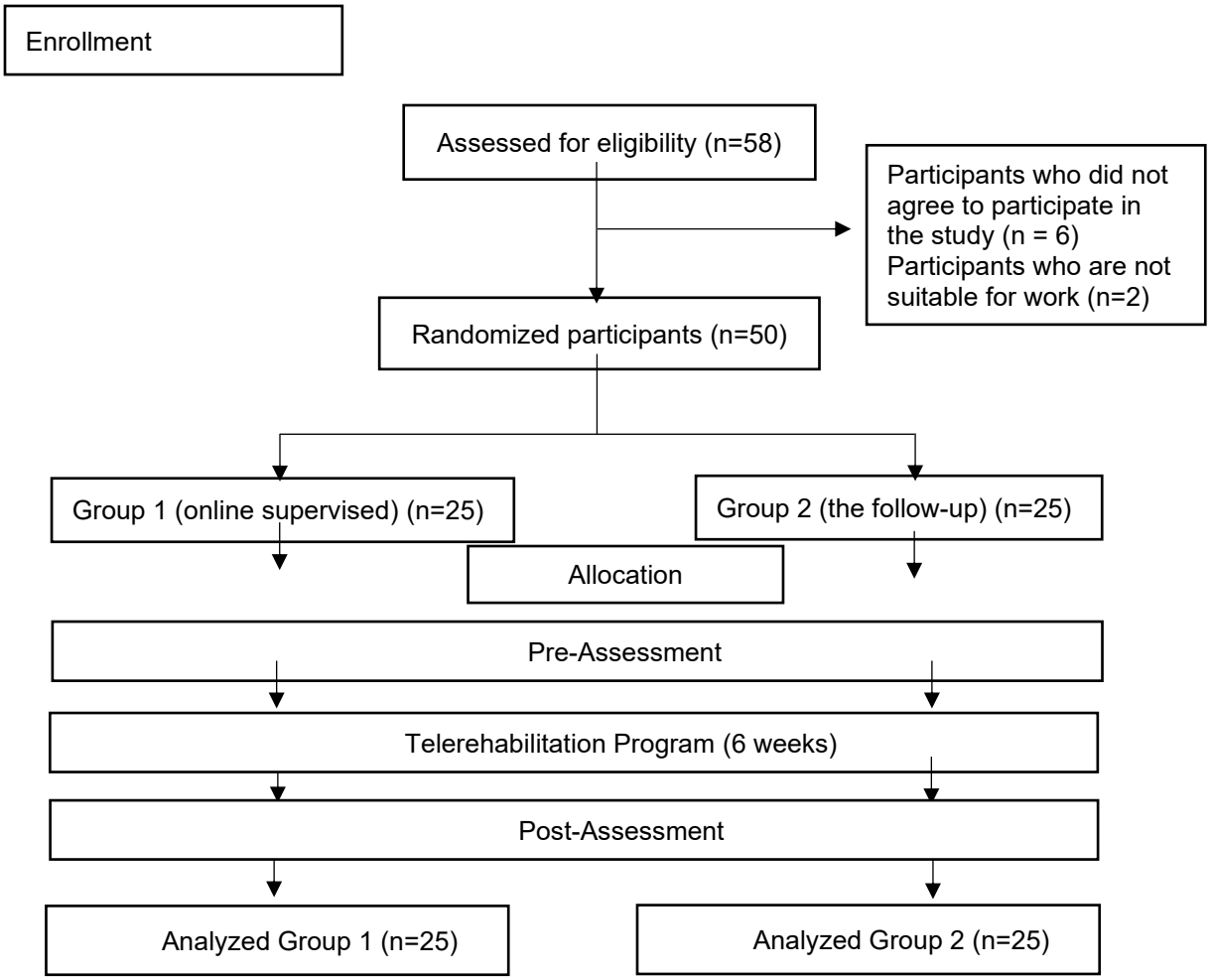

Figure 1. *Consort Flow Diagram*

At baseline, there were no differences between the groups in any of the outcome measures ($p > 0.05$). However, after the treatment, a significant difference was found between the groups in the COVID-19 Fear Scale ($p=0.030$), while no differences were observed in the other measures ($p > 0.05$). In intra-group comparisons, significant differences were observed in all measurements ($p < 0.05$) (Table 2). While a small effect size is observed between groups, the effect size within the group is observed to be greater in Group 1 (Table 2).

Table 1. Baseline characteristics of the participants

	Group 1 (n=25)	**Group 2 (n=25)**	**p value**
Age (years), mean (SD)	35.12 (13.691)	34.36 (11.9)	*0.83
Body mass index (kg/cm2), mean (SD)	24.33 (4.47)	24.61 (4.06)	*0.82
Sex, n (%)			
Female	19(76)	16(64)	**0.36
Male	6(24)	9(36)	
Marital status, n (%)			
Married	15(60)	14 (56)	*0.77
Single	10(40)	11 (44)	
Education level, n (%)			
12 years or less	12(48)	10(40)	*0.57
More than 12 years	13(52)	15(60)	
Smoking history, n (%)			
Yes	2(8)	6(24)	*0.25
No	23(92)	19(76)	
Alcohol history, n (%)			
Yes	0(0)	2(8)	*0.49
No	25(100)	23(92)	
Time since COVID-19 (%)			
1-3 months	19(76)	21(84)	*0.48
3 months and more	6(24)	4(16)	

*Values are mean (standard deviation); SD: Standard deviation; n: number of people; %: percent. **Independent t-test, *Chi-square test.*

Table 2: Comparison of outcomes between and within groups

Outcomes		Group 1 (n=25) Mean (SD) Median(min-max) IQR (25-75)	Group 2 (n=25) Median (IQR) Median(min-max) IQR (25-75)	Between-group p value	Effect Size r
MRC Dyspnea Scale (1-5)	Pre-treatment	1.17 (0.70) 1(0-2) 1(1-2)	1.31 (0.85) 1(1-3) 1 (1-2)	*0.44	
	Post-treatment	0.67 (0.70) 1(0-2) 1(0-1)	0.72 (0.73) 1(1-2) 1 (0-1)	*0.71	0.07
	Within groups p value	***0.001**	***0.005**		
	** Effect Size (Z, r)	-3.207, 0.64	-2.809, 0.56		
IPAC-SF	Pre-treatment	2037.04(2585.14) 945.75(0-8692) 2808.8 (198.75-3006.75)	3277 (3273.88) 2088(165-11403) 4479.5 (725.50-5205)	*0.08	
	Post-treatment	3599.64(4388.75) 1417.75(0-14686) 4149.8 (711-6171.50)	4055.42(3830.28) 2706(424-15190) 5118.8 (1100.75-6219.50)	*0.33	0.19
	Within groups p value	***0.004**	***0.040**		
	** Effect Size (Z, r)	-2.859, 0.57	-2.058, 0.41		
SGRQ (0-100)	Pre-treatment	20.89 (14.16) 19.73(1.46-55.60) 20.71 (8.74-28.93)	22.95 (15.30) 19.73(1.59-55.10) 20.44 (12.89-33.32)	*0.55	
	Post-treatment	12.41 (10.33) 11.22(1.46-44.32) 13.01 (3.78-16.51)	14.07 (10.08) 11.27(1.59-37.17) 14.21 (6.74-20.95)	*0.46	0.14
	Within groups p value	***0.000**	***0.000**		
	** Effect Size (Z, r)	- 4.197, 0.8394	- 4.152, 0.8304		
Nottingham Health Profile I (0-100)	Pre-treatment	113.64 (87.68) 101.83(0-332.35) 149.06 (36.78-191.19)	100.18 (91.26) 65.47(0-385.14) 131.15 (34.31-165.46)	*0.35	
	Post-treatment	52.70 (50.67) 33.09 (0-183.53) 77.01 (13.50-94.88)	50.80 (54.21) 28.67 (0-180.29) 68.64 (10.79-79.42)	*0.54	0.12
	Within groups p value	***0.000**	***0.002**		
	** Effect Size (Z, r)	-4.049, 0.80	-3.041, 0.60		

Table 2: Comparison of outcomes between and within groups (continued)

Outcomes		Group 1 (n=25) Mean (SD) Median(min-max) IQR (25-75)	Group 2 (n=25) Median (IQR) Median(min-max) IQR (25-75)	Between-group p value	Effect Size r
Fear of COVID-19 Scale (7-35)	Pre-treatment	17.76 (6.88) 19 (7-32) 11 (12-22)	14.60 (5.56) 15 (7-24) 9 (9.50-18)	*0.10	
	Post-treatment	15.64 (5.84) 14 (7-30) 10 (10.50-20)	12.32 (5.24) 11 (7-25) 9 (7-15.50)	***0.030**	**0.43**
	Within groups p value	***0.006**	***0.007**		
	** Effect Size (Z, r)	-2.725, 0.54	-2.694, 0.53		
FSS (9-63)	Pre-treatment	4.52 (1.19) 5.10 (2.1-6.4) 1.7 (3.65-5.40)	4.45 (1.03) 4.80 (1.6-5.6) 1.9 (3.40-5.35)	*0.60	
	Post-treatment	3.60 (1.02) 3.7 (2-5.3) 1.8 (2.50-4.40)	3.48 (1.15) 3.4 (1.1-5.6) 1.7 (2.75-4.40)	*0.78	0.05
	Within groups p value	***0.000**	***0.001**		
	** Effect Size (Z, r)	-4.267, 0.85	-3.430, 0.68		

*Data are expressed as mean ± standard deviation; SGRQ: St. George's Respiratory Questionnaire; MRC: Medical Research Council; IPAC-SF: International Physical Activity Questionnaires-Short Form; FSS: Fatigue Severity Scale; Statistically significant p-values are indicated in bold; *Mann-Whitney U Test (Between-group), Wilcoxon Signed Ranks Test (Within groups); ** Effect Size (Wilcoxon Signed Ranks Test (Z, r)*

4. Discussion

The aim of this study was to compare the effects of telerehabilitation-based exercise programs on the fear of COVID-19, physical activity, QoL, and fatigue in individuals who had been diagnosed with and recovered from COVID-19. Although there were no significant differences between the groups in baseline measurements, a significant difference was found only in the COVID-19 Fear Scale after treatment, favoring Group 1 (online supervised). Within-group comparisons revealed significant improvements across all assessments.

The Fear of COVID-19 Scale

In this study, it was observed that post-treatment fear levels related to COVID-19 decreased significantly in both groups. This indicates that both treatment methods used in this study were effective in reducing fear. The difference observed between the groups after the treatment implies that the telerehabilitation method performed with a physiotherapist, with G1, increased participants' sense of confidence and, accordingly, the participants' fear levels decreased more. It has been suggested that COVID-19-related mental health needs arise independently of age, occupation, and education, and are linked to physical inactivity, insomnia, anxiety, depression, and fear of COVID-19 (Ornell et al., 2020), and that fear arises from a longer period of isolation and greater restriction of movement (Banerjee, 2020).

A review of the literature reveals that few studies have been conducted that are similar to the present study. In one study, a significant difference was found in fear scores between individuals with and without COVID-19 symptoms, showing an inverse relationship between the presence of symptoms and fear scores (Ornell et al., 2020). In the study by Cankurtaran et al. (Cankurtaran et al., 2021) in children with cerebral palsy and their caregivers, the caregivers stated that the follow-up visits of children became irregular. Disruptions in routine follow-up were observed in 86.2% of 94 patients, with the primary reasons being fear of contracting COVID-19 and scheduling conflicts. Additionally, more than half of the caregivers reported a high level of fear regarding COVID-19.

It is widely accepted in the literature that exercise approaches are effective and applicable for improving various parameters, especially mental health, during the COVID-19 outbreak. In particular, for infectious diseases like COVID-19, telerehabilitation-based approaches provide individuals with the opportunity to exercise safely by eliminating human-to-human contact (Kepenek-Varol et al., 2022). Another study reported that people with Parkinson's disease are concerned about exposure to COVID-19. It was noted that these patients are carefully following COVID-19 precautions, rarely leaving home for non-essential or social activities. Even as restrictions ease and more people are vaccinated, clinicians have observed that individuals with Parkinson's disease may still feel anxious about returning to in-person exercise. In this context, telerehabilitation has been found to be much more reliable, especially for certain disease populations (Mañago et al., 2021).

It is possible that the decrease in fear levels was due to individuals exercising safely at home without the risk of COVID-19 transmission. It is possible that the decrease in fear levels was due to the fact that individuals felt safer when they regularly interacted with physiotherapists in video call sessions and exercised together.

Physical Activity Level

It was observed that the physical activity levels of individuals in both groups increased significantly, with no significant difference between the groups. This may be attributed to both telerehabilitation methods (supervised online sessions and follow-up), which included the same exercise program, increasing the physical activity levels of individuals in a similarly significant manner. Throughout and following the COVID-19 pandemic, the physical activity levels of individuals in all age populations decreased significantly, and their sedentary duration increased (Castañeda-Babarro et al., 2020). A decrease in physical activity can also affect the physiological systems of the body (Melzer et al., 2004). It is known that regular physical activity strengthens the immune system and reduces the risk of infection in the long term (Shepard & Shek, 1996). For this reason, increasing physical activity levels through exercise is a critical concern.

Dwyer et al., in their letter to the editor, recommended physical activity during the COVID-19 pandemic due to its numerous benefits for physical and mental health, provided social distancing is observed. In addition, personalized education according to age, clinical conditions, and fitness level is very important; therefore, they highlighted the significant need for tailored recommendations for home-based education during this period (Dwyer et al., 2020). During home confinement, when physical inactivity has significantly increased, it is crucial for individuals to enhance physical activity through telerehabilitation exercise. Systematic reviews in this field indicate that telerehabilitation interventions can effectively and safely improve physical function, functional capacity, and exercise perception in post-COVID-19 patients, with minimal side effects (Seid et al., 2022; Yang et al., 2024).

The current study is also consistent with the above studies and findings from a systematic review that found that physical activity levels decreased after the recent pandemic (Stockwell et al., 2021). The IPAQ-SF results of the individuals in the current study show that at the outset, both groups exhibited low levels of physical activity, whereas after the treatment, a significant improvement was observed in both groups, and their physical activity levels increased. Physical activity, which decreased with COVID-19, is among the results we expect to increase with exercise. We attribute the absence of differences between the groups to the effectiveness of the telerehabilitation methods (online supervised or follow-up) we applied and which were effective, and the physiotherapy training provided led to improvement in both groups.

Fatigue Severity

After the treatment, the participants in both groups experienced lower levels of fatigue severity pre-treatment. This result indicates that the physiotherapy program applied reduced the severity of fatigue in individuals, as stated in the studies above. The absence of any observed difference between the groups suggests that the two telerehabilitation methods we applied had similar effects. According to the literature, post-COVID-19, fatigue and dyspnea are among the most commonly reported symptoms(Cares-Marambio et al., 2021). It has been stated that these symptoms are closely related to the long-term presence of COVID-19 (Sudre et al., 2021). Therefore, therapeutic modalities such as telerehabilitation, which can reduce symptoms, are recommended for people who, in addition to

persistent symptoms, experience significant reductions in physical capacity and QoL (Rivera-Lillo et al., 2020).

A systematic review and meta-analysis found no significant difference in fatigue reduction between telerehabilitation and face-to-face pulmonary rehabilitation in patients after COVID-19 (Oliveira et al., 2024). These results are also parallel to the current study results.

Quality of Life

It was observed that the quality of life significantly increased in both groups after the treatment, with similar results. This similarity may be due to the fact that the same exercise program was applied. Living conditions changed significantly during and after the pandemic, and sedentary time increased. With the periods of isolation, the QoL of people has decreased significantly. It has been stated that the QoL of individuals who exercised during the COVID-19 pandemic was higher than that of those who did not. It is said that physical activity and exercise have many positive effects both during a pandemic and in normal periods, and accordingly increase the QoL (Tunç et al., 2020).

Therefore, a strong relationship is observed between exercise and QoL. The studies in the literature exploring the effect of telerehabilitation-based exercise therapy on the QoL in individuals diagnosed with COVID-19 and recovered indicate that exercise improves the QoL (Li et al., 2022; Patel et al., 2021). A review of the literature reveals that telerehabilitation interventions for individuals with COVID-19 have a significant impact on quality of life, dyspnea, fatigue, and functional capacity. These findings are consistent with the results of the current study (Martins et al., 2024; Vieira et al., 2022).

It is likely that issues such as fatigue, physical inactivity, muscle weakness, cognitive problems, and respiratory issues experienced by individuals who have had COVID-19 can be alleviated through exercise, leading to an improvement in their quality of life. As mentioned earlier, telerehabilitation is the most reliable method for exercising during the COVID-19 period. For these reasons, it is believed that the telerehabilitation methods applied significantly enhance the quality of life for individuals.

Conclusion

As a result, the effects of two different telerehabilitation methods (online supervised and follow-up) were investigated in this study, and it was found that both methods had significant positive effects on the participants' physical activity, respiratory function, quality of life, fear, and fatigue levels. This study demonstrated that the negative effects caused by individuals staying at home and experiencing COVID-19 symptoms can be significantly reduced through exercise practices performed safely at home. Additionally, the observed difference between the groups in the COVID-19 Fear Scale after treatment may be attributed to the participants in the online supervised method feeling safer and receiving greater reassurance from the physiotherapist through video calls.

Considering these results, the study suggests that telerehabilitation-based exercise programs may contribute meaningfully to post-COVID-19 recovery, with the potential to enhance participants' physical activity levels and quality of life. Furthermore, comparisons between the online supervised and the follow-up methods emphasize that both approaches are similarly effective, and the use of these methods may be beneficial.

Conflict of Interest

There is no conflict of interest among the authors.

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