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KINESIOPHOBIA, PHYSICAL ACTIVITY, DEPRESSION, ANXIETY, AND STRESS LEVELS IN POST COVID-19 INDIVIDUALS: A CROSS-SECTIONAL STUDY

COVID-19 GEÇİRMİŞ BİREYLERDE KİNEZYOFOBİ, FİZİKSEL AKTİVİTE, DEPRESYON, ANKSİYETE VE STRES DÜZEYLERİ: KESİTSEL BİR ÇALIŞMA

Gülşah Bargı[1*]

[1]Izmir Democracy University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, İzmir, Turkey

ORCID iD: Gülşah Bargı: 0000-0002-5243-3997

***Sorumlu Yazar / Corresponding Author:** Gülşah Bargı **e-posta / e-mail:** gulsahbargi35@gmail.com

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Abstract

Objective: Kinesiophobia, inactivity and mood disturbances in post-COVID-19 individuals are poorly investigated. Therefore, the aim of this study was to compare measures of kinesiophobia, physical activity, depression, anxiety and stress in post-COVID-19 individuals and healthy individuals.
Methods: This cross-sectional study was conducted between 25 November 2021 and 30 December 2021. The individuals were recruited from the general community. Kinesiophobia was assessed with the Tampa Scale of Kinesiophobia, physical activity levels with the International Physical Activity Questionnaire Short-Form, and mood (depression, anxiety, and stress) with the Depression Anxiety Stress-21 Scale in all individuals.
Results: There were 29 volunteer individuals who had COVID-19 with a mean age of 33.41±7.95 years. Healthy controls consisted of 20 volunteers with a mean age of 31.3±7.81 years. Anxiety (55.2% versus 20%) and stress (34.5% versus 5%) were observed more frequently in the post-COVID-19 group. The scores for kinesiophobia and anxiety were significantly higher in post-COVID-19 individuals than healthy individuals (p<0.05). The scores for physical activity, depression and stress were similar between groups (p>0.05). Significant correlations were found among post-COVID-19 individuals for i) the scores for kinesiophobia and stress, and ii) the scores for physical activity, stress, and depression (p<0.05). There was no relationship between kinesiophobia and other outcomes in healthy individuals (p>0.05).
Conclusion: Although a high degree of kinesiophobia is observed in both post-COVID-19 and healthy individuals, kinesiophobia, anxiety and stress measures were higher in people exposed to COVID-19 than others. In post-COVID-19 individuals, kinesiophobia increased as stress increased, and physical activities decreased while stress and depression increased. Hence, exercises, physical activities and psychological counseling should be recommended to individuals exposed to COVID-19.

Keywords: *Anxiety, COVID-19, depression, exercise, movement, physical activity.*

Öz

Amaç: COVID-19 geçirmiş bireylerde kinezyofobi, inaktivite ve duygu durum bozuklukları yeterince araştırılmamıştır. Bu nedenle, bu çalışmanın amacı COVID-19 geçirmiş ve sağlıklı olan bireylerde kinezyofobi, fiziksel aktivite, depresyon, anksiyete ve stres ölçümlerini karşılaştırmaktı.
Yöntem: Bu kesitsel çalışma 25 Kasım 2021 ile 30 Aralık 2021 tarihleri arasında gerçekleştirildi Bireyler genel toplumdan dahil edildi. Tüm bireylerde kinezyofobi Tampa Kinezyofobi Ölçeğiyle, fiziksel aktivite Uluslararası Fiziksel Aktivite Anketi Kısa-Formuyla ve ruh hali (depresyon, anksiyete ve stres) Depresyon Anksiyete Stres Ölçeği-21 ile değerlendirildi.
Bulgular: Ortalama yaşı 33,41±7,95 yıl olan COVID-19 geçirmiş 29 birey vardı. Sağlıklı kontroller, yaş ortalaması 31,3±7,81 yıl olan 20 gönüllüden oluşuyordu. COVID-19 geçirmiş grupta anksiyete (%55,2'ye karşı %20) ve stres (%34,5'e karşı %5) daha sık gözlendi. Sağlıklı bireylere göre COVID-19 geçirmiş bireylerde kinezyofobi ve anksiyete puanları anlamlı olarak daha yüksekti (p<0,05). Gruplar arasında fiziksel aktivite, depresyon ve stres puanları benzerdi (p>0,05). COVID-19 geçirmiş bireylerde i) kinezyofobi ve stres puanları ve ii) fiziksel aktivite, stres ve depresyon puanları arasında anlamlı ilişkiler bulundu (p<0,05). Sağlıklı bireylerde kinezyofobi ile diğer sonuçlar arasında ilişki yoktu (p>0,05).
Sonuç: Hem COVID-19 geçirmiş hem de sağlıklı bireylerde yüksek derecede kinezyofobi görülse de COVID-19'a maruz kalan bireylerde kinezyofobi, kaygı ve stres ölçümleri diğerlerine göre daha yüksekti. COVID-19 geçirmiş bireylerde stres arttıkça kinezyofobi arttı ve stres ve depresyon arttıkça fiziksel aktiviteler azaldı. Bu nedenle COVID-19'a maruz kalan bireylere egzersiz, fiziksel aktiviteler ve psikolojik danışmanlık önerilmelidir.

Anahtar Kelimeler: *Anksiyete, COVID-19, depresyon, egzersiz, fiziksel aktivite, hareket.*

Introduction

After the World Health Organization (WHO) declared the new coronavirus as a pandemic due to rapid transmission and higher death rates, many health problems began to appear, both in individuals who contracted SARS-CoV-2, leading to the condition COVID-19, and others who did not apparently contract the infection.[1] Although the devastating effects of COVID-19 on human health have decreased during the protracted pandemic process, health problems due to COVID-19 contact continue to emerge.[1] Low level of physical activity, decreased muscle strength, frailty and impairment in daily living activities and poor quality of life (QOL) have been reported in elderly patients with community-acquired pneumonia caused by acute COVID-19.[1] Moreover, mood disturbances, alterations in skeletal muscle structure, muscle weakness, pulmonary abnormalities, fatigue, and exercise intolerance have been also experienced by patients with acute or post-acute COVID-19.[1-8]

Various physical or psychological disorders persist even after the COVID-19 infection has passed. Dyspnea, decreased exercise capacity and lower limb strength, poor QOL, and worse running kinetics have been observed in post-COVID-19 individuals.[7,9,10] Individuals with no known cardiopulmonary disease who have a history of COVID-19 have been reported to have decreased oxygen consumption, due to peripheral cardiac limit, and increased hyperventilation response to exercise.[7] Furthermore, it has been demonstrated that elderly men with post-COVID-19 sarcopenia have kinesiophobia.[5]

Currently, the negative effects of COVID-19 on health, including psychological and physical deterioration, continue to be reported during the prolonged COVID-19 pandemic. Although psychological and physical health problems in individuals who have had COVID-19 are documented,[1-10] problems regarding kinesiophobia, physical activity, depression, anxiety, and stress levels in individuals who have had COVID-19 have not been compared to those reported by healthy individuals. Therefore, the aim of this study was to compare measures of kinesiophobia, physical activity levels, depression, anxiety, and stress in individuals after experiencing COVID-19 and healthy individuals with no known COVID-19 infection.

Methods

Study Design

This cross-sectional study was carried out prospectively at Izmir Democracy University Faculty of Health Sciences, Departments of Physiotherapy and Rehabilitation. Izmir Democracy University Non-Interventional Clinical Research Ethics Committee approved the study with its decision dated 03/11/2021 and numbered 2021/14-02 before the individuals were included in the study. Clinical trial Id was ACTRN12621001747819. After the study was also approved by the Ministry of Health, the study was conducted consistent with the Declaration of Helsinki. Adult individuals were reached through social media or close acquaintances and informed about the purpose and method of the research at the beginning of the study. Informed consent was obtained from all individuals who agreed to participate in the study. Between 25 November 2021 and 30 December 2021, an online form prepared using Microsoft Forms was filled out by all individuals via an e-mail or messaging applications on their mobile phones, such as SMS, WhatsApp, or Instagram.

Study Population

Inclusion criteria for individuals who had recovered from COVID-19, proven by a positive Polymerase Chain Reaction (PCR) test result or having lung X-ray or lung tomography compatible with COVID-19 infection despite negative PCR test results were: being aged between 18 and 65; volunteering to participate in the study; having recovered in quarantine at home and/or discharged from hospital due to COVID-19; being able to understand and answer questionnaires; and possessing the technology to receive the electronic questionnaires. Exclusion criteria were: having any physical, cognitive, or mental disability or disease or impairment; being newly diagnosed with COVID-19 and therefore in quarantine at home or receiving treatment in hospital; having suspected COVID-19; being pregnant; and/or having any chronic disease that could prevent individuals from doing physical activity.

Inclusion criteria for healthy controls were: being aged between 18 and 65; volunteering to participate in the study; being able to understand and answer questionnaires; and having the technological devices to receive the questionnaires. Exclusion criteria for controls were: having any physical or mental disability; having any acute or chronic infection and/or health problem; or being in quarantine for any reason.

Measurements

Tampa Scale of Kinesiophobia

The Tampa Scale of Kinesiophobia contains 17 items about injury or re-injury in work-related activities, fear, and avoidance.[11] The answers are based on a 4-point Likert-type scoring, from 1 (strongly disagree) to 4 (totally agree). Higher total scores indicate an increased kinesiophobia level. A cut-off score for high degree of kinesiophobia is defined as >37 points. The scale was translated and Turkish language version validated by Tunca Yilmaz et al.[11]

International Physical Activity Questionnaire Short Form

International Physical Activity Questionnaire Short Form measures daily sitting time, frequency (days) and duration (min) of physical activities done during the last week such as walking, moderate or vigorous-intensity activities.[12] When minute (min), day and metabolic equivalent (MET) value for each activity are multiplied, a separate score is obtained for each activity type in the form of "MET-min/week". According to these scores, individuals are also classified as physically inactive, minimal active, and very active. The scale was translated and Turkish language version validated by Saglam et al.[12]

Depression Anxiety Stress-21 Scale

Depression Anxiety Stress-21 Scale includes three sub-assessments with seven items in each of the sub-assessments.[13] Answers given to the items range from 0 (not suitable for me) to 3 (completely suitable for me). The respondent has depression, anxiety, or stress if the score of each sub-assessment is ≥5 points (depression), ≥4 points (anxiety), or ≥8 points (stress). The scale was translated and Turkish language version validated by Sarıcam.[13]

Statistical analyses

To determine difference in kinesiophobia scores (9.1) between two independent groups for an α value of 0.05, effect

size of 1.5, and a power of 95%, at least 18 individuals for post-COVID-19 group and 10 individuals for healthy group were calculated via GPower (G*Power 3.0.10 system) program.[14] Moreover, post-hoc power (1-β) and effect size d were calculated by the same program. Statistical analyses were performed using SPSS, version 15.0 (IBM Inc., Armonk, NY, USA). Descriptive analyses are given using frequency (n), percentage (%), mean and standard deviation (×±ss), mean difference confidence interval (95%CI) and U value. Comparison of variables was made using Student t, Mann-Whitney U and Chi-square tests. Relationships between variables were determined by Spearman and Pearson tests. Probability of error was determined as $p<0.05$.

RESULTS

As shown in Figure 1, of the 44 post-COVID-19 individuals, 15 were excluded from the study due to having acute COVID-19 (n=10), refusing to answer the online form (n=3) and pregnancy (n=2). Of 33 healthy individuals, 13 were excluded from the study due to contact with someone with acute COVID-19 (n=7) and refusing to answer the online form (n=6). Therefore, the responses of 29 post-COVID-19 individuals and 20 healthy individuals were analyzed.

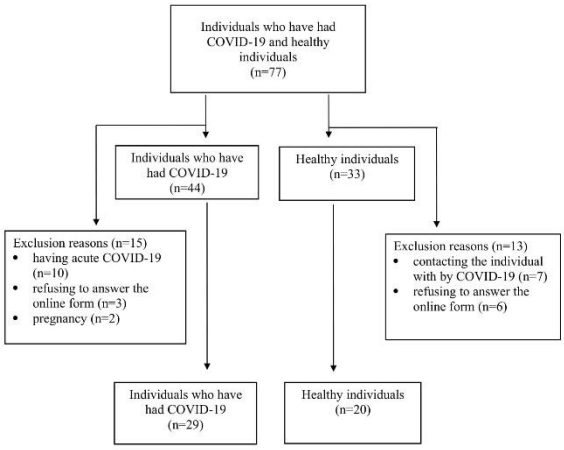

Figure 1. Flow diagram of individuals who have had COVID-19 and healthy individuals in the study.

Baseline characteristics, depression rates, and kinesiophobia rates were similar between groups (Table 1, Figure 2, $p>0.05$). Post-COVID-19 individuals tended to be less physically inactive (6.9% versus 25%), but more likely to be minimal active (86.2% versus 60%) or very active (6.9% versus 15%) compared to healthy controls, but these differences did not reach significance (Figure 3, $p>0.05$). However, post-COVID-19 individuals had significantly higher rates of anxiety (55.2%) and stress (34.5%) than others (Figure 2, $p<0.05$).

Kinesiophobia (effect size d: 0.71, 1-β: 0.66) and anxiety (effect size d: 0.92, 1-β: 0.87) scores were significantly higher in post-COVID-19 individuals compared to others (Table 2, $p<0.05$). While there were significant correlations between kinesiophobia and stress ($r=0.427$, $p=0.021$) and total Depression Anxiety Stress-21 Scale ($r=0.438$, $p=0.018$) scores in the post-COVID-19 group ($p<0.05$), no significant correlations between kinesiophobia and other outcomes

Table 1. Baseline demographic characteristics of the individuals.

	Individuals who had COVID-19 (n=29) mean±SD† / n; %†	**Healthy individuals (n=20) mean±SD / n; %†**	***p*‡**
Age (year)	33.41±7.95	31.3±7.81	0.361
Male / Female	14; 48.3% / 15; 51.7%	7; 35% / 13; 65%	0.356
Weight (kg)	75.97±14.12	72.83±16.41	0.478
Height (cm)	172.24±9.88	171.75±9.16	0.861
Body mass index (kg/m^2)	25.52±3.96	24.42±3.51	0.321
Daily sleeping duration (hour)	6.89±0.94	7.45±1.36	0.098
Education level			
Elementary school	0; 0%	1; 5%	0.819
High school	4; 13.8%	3; 15%	
College	12; 41.4%	8; 40%	
Postgraduate	10; 34.5%	6; 30%	
Doctorate	3; 10.3%	2; 10%	
Individuals with chronic illness	5; 17.2%	0; 0%	0.141
Asthma	1; 3.44%		
Diabetes mellitus	1; 3.44%		
Hypertension	1; 3.44%		
Chronic Glomerulonephritis	1; 3.44%		
Thyroid disease	1; 3.44%		
Time elapsed from diagnosis of COVID-19 to evaluation date (day)	255.69±175.08		
Time elapsed from diagnosis of COVID-19 to evaluation date (month)	8.4±5.75		
The places administered COVID-19 treatments			
In quarantine at home	28; 96.6%		
At the COVID-19 service of the hospitals	1; 3.4%		

kg: kilogram, cm: centimeter, m: meter, COVID-19: New coronavirus disease 2019.
†Descriptive analyses are presented using mean±standard deviation (SD) and frequency/percentage (n/%) for normally distributed and categorical variables, respectively.
‡Student's t-test *$p<0.05$ and Chi square test ¥$p<0.05$.

existed in healthy individuals ($p>0.05$). Moreover, there were significant correlations between vigorous physical activity and stress ($r=-0.456$, $p=0.013$), moderate-intensity physical activity and stress ($r=-0.382$, $p=0.041$), moderate-intensity physical activity and depression ($r=-0.517$, $p=0.004$), total physical activity and depression ($r=-0.426$, $p=0.021$) in the post-COVID-19 group ($p<0.05$).

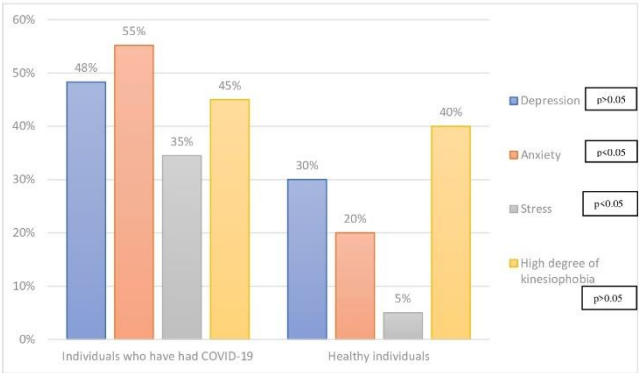

Figure 2. Presence of depression, anxiety, stress, and high degree of kinesiophobia in healthy and COVID-19 individuals.

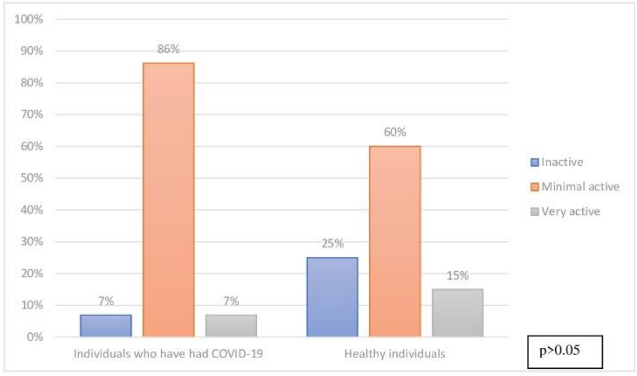

Figure 3. Rate of physical activity levels in the groups.

Table 2. Comparison of kinesiophobia, physical activity, depression, anxiety, and stress between individuals who have had COVID-19 and healthy individuals.

	Individuals who had COVID-19 (n=29) mean±SD†	Healthy individuals (n=20) mean±SD†	Mean difference (95%CI) / U	p‡
Total score on Tampa Scale of Kinesiophobia (17-68 points)	37.79±4.17	34.4±5.42	-3.39 (-6.15 to -0.64)	**0.017***
Vigorous physical activity (MET-min/week)	398.62±595.55	648±920.47	241.5	0.293
Moderate-intensity physical activity (MET-min/week)	351.72±338.51	391±359.79	270.5	0.689
Walking (MET-min/week)	765.26±371.82	705.38±597.1	222	0.166
Total physical activity (MET-min/week)	1515.6±861.88	1744.38±1411.89	281	0.855
Daily sitting duration (hour)	15.74±1.04	15.07±1.48	-0.67 (-1.39 to 0.05)	0.067
DASS-21 depression score (0-21)	4.79±3.48	3.7±2.56	245.5	0.362
DASS-21 anxiety score (0-21)	4.41±3.01	2.4±1.35	170	**0.013#**
DASS-21 stress score (0-21)	6.04±3.77	5.25±1.83	-0.79 (-2.42 to 0.85)	0.338
DASS-21 total score (0-63)	15.24±8.58	11.35±4.26	209.5	0.101

COVID-19: New coronavirus disease 2019, MET: metabolic equivalent, min: minute, DASS-21: Depression Anxiety Stress-21 Scale, CI: confidence interval and U: U value.
†Descriptive analyses are presented using mean±standard deviation (SD) for numerical variables.
‡Student's t-test *p<0.05 and Mann-Whitney U test #p<0.05.

Discussion

To the best of our knowledge, this is the first study to show differences and associations between kinesiophobia, anxiety and stress levels when comparing people after COVID-19 and un-infected individuals. These intriguing findings include: 1) increased kinesiophobia (44.8% versus 40%) was found in this cohort of post-COVID-19 individuals compared to un-infected individuals; 2) post-COVID-19 individuals reported greater anxiety (55.2%) and stress (34.5%); 3) increased kinesiophobia scores was associated with increased stress level scores in post-COVID-19 individuals; and 4) daily physical activity scores decreased when stress and depression scores increased in post-COVID-19 individuals.

Nambi et al.[5] demonstrated that elderly men with post-COVID-19 sarcopenia had kinesiophobia, consistent with the results of our study, but the mean kinesiophobia scores of these elderly men were slightly lower than the scores in our younger cohort. The higher score found in our study may arise from the duration between study evaluation and diagnosis of COVID-19 was about 8.4 months. This time may be a little short to recover from pain symptoms related with COVID-19 and alterations in skeletal muscle structure[4] which should be investigated further. Therefore, many post-COVID-19 patients may need and benefit from rehabilitation programs due to persistent complaints, including dyspnea, decreased exercise capacity, lower limb strength and poor QOL[10] along with kinesiophobia. The presence of increased kinesiophobia may be attributed to having dyspnea and/or decreased exercise tolerance.[10] As our results firstly showed higher kinesiophobia, anxiety and stress levels in post-COVID-19 individuals, while the pandemic continues to afflict both patients with chronic conditions and other individuals, a multicomponent program consisting of pain neuroscience education, psychological support and/or physical activity counselling should be recommend to people recovering from COVID-19.[10,15-17]

Most of the post-COVID-19 individuals (93.1%) and healthy individuals (85%) were not sufficiently physically active in the current study. Bargı et al reported an positive linear association between physical inactivity and sedentary lifestyle as the duration of the pandemic has lengthened.[18] Consistent with our findings in uninfected individuals, Bargı et al showed that, while physical inactivity (31.7%) and minimal activity level (40.9%) are found in healthy individuals during the pandemic, there was no relation with physical activities, stress, anxiety and depression.[18] On the other hand, Ryrsø et al.[1] found that 84% of elderly patients with acute COVID-19 were minimally active and only 12% of these patients did moderate to high physical activity.[1] These proportion is considerably greater than we found but there is a large age difference between the two study populations. Other reasons for the difference may be related to increased negative effects of acute severe COVID-19 in an elderly male population or decreased muscle strength in patients with COVID-19.[1] Therefore, adding strengthening and balance exercises to schedules of individuals who recovered from COVID-19 is recommended to the therapists.[9]

Patients with multiple sclerosis who were exposed to COVID-19 had lower total, vigorous, moderate and walking physical activity scores compared to multiple sclerosis patients without COVID-19[19], and unsurprisingly these were lower than found in either of our groups. In our study, only 17.2% of the post-COVID-19 group had chronic diseases while none of the control group had any. However, the combination of multiple sclerosis and COVID-19 in patients seems to have profoundly affected physical activities. This may be attributed to decreased oxygen consumption/exercise capacity due to peripheral cardiac limit and increased hyperventilation response to exercise individuals with post-COVID-19.[7] Further studies are needed to investigate the causality of this effect in subjects with pre-COVID-19 chronic illnesses and previously healthy controls. It is known that, patients with COVID-19 who were physically inactive were at higher risk of hospitalization, admission to intensive care unit and death due to COVID-19 compared to patients who were physically active.[20] It has also been suggested that

doing physical activity is related to lower COVID-19 hospitalization which shows a protective effect of physical activity.[21] Therefore, physical activity counseling should be included in programs of patients with acute/post COVID-19.[20]

Higher anxiety (55.2% versus 20%) and stress (34.5% versus 5%) levels were demonstrated in the post-COVID-19 group while there was no difference in depression levels (48.3% versus 30%) when compared to uninfected controls. Stress and depression levels were positively correlated with kinesiophobia scores and negatively correlated with physical activity levels in the post-COVID-19 group. Van den Borst et al.[2] showed that anxiety (7%) and depression (22%) were present in 27 patients who have had mild-COVID-19 in a total of 124 patients, even at 3 months after recovery.[2] During the COVID-19 pandemic, the number of newly diagnosed anxiety disorders also increased by approximately 19-21%.[22] These findings are lower than values found in the present study. Given the time difference between these studies and ours, it may suggest that as the pandemic continues, the levels of anxiety, depression and stress may be increasing although much larger studies from different populations would be needed to confirm this hypothesis in the whole population. Özlü et al. showed that patients with acute COVID-19 (79% had chronic illness) had anxiety who were in the clinic due to COVID-19.[3] Grbovic et al. showed that 61.9% of patients with acute COVID-19 had anxiety, ranging from mild to severe.[23] Moreover, anxiety in these patients decreased from 61.9% to 50% following a respiratory exercise program.[23] These anxiety rates in patients with acute COVID-19 are consistent with our individuals recovering from COVID-19. We suggest that anxiety may persist, at least in our population, in individuals exposed to COVID-19 even 8.4 months after COVID-19. This may be because these people experience exercise intolerance, peripheral muscle weakness and dyspnea problems even after recovering from COVID-19.[1,4,7,8] Therefore, to improve mental health, individuals who have had mild-COVID-19 should be directed to psychological and/or physical activity counseling since they are reported to be beneficial in recovery from anxiety and other mental health disorders in post-COVID-19 individuals.[5,24]

Limitations

The most important limitation of this study was that individuals who had experienced severe or moderate COVID-19 were not included. Post-COVID-19-acquired symptoms including psychological and physical impairments are greater in patients who have had severe COVID-19 compared to mild COVID-19.[2] Moreover, kinesiophobia, physical inactivity, anxiety, depression, and stress levels may interact and will also probably affect other body systems, such as the musculoskeletal and cardiovascular systems. Therefore, both physical impairment and psychological parameters should be investigated in post-COVID-19 individuals in further studies.

Conclusion

While COVID-19 and the new variants of SARS-CoV-2 continue to afflict the whole world, this novel study has provided findings that highlight the more specific rehabilitation needs of individuals exposed to COVID-19 and a more comprehensive approach to public health. This study has shown that, in this cohort, post-COVID-19 individuals had higher kinesiophobia, anxiety and stress levels compared to uninfected controls. Moreover, there were positive correlations between stress and depression levels and increasing kinesiophobia scores while daily physical activities decreased in individuals exposed to COVID-19. The beneficial effects of increasing general exercise and activity levels in the population have been shown to reduce the risk of comorbid disease and improve immune function. We suggest that post-COVID-19 individuals may benefit from rehabilitation in terms of reducing their kinesiophobia and improving their physical activity levels and mental health. Given the huge numbers of individuals in the population who have recovered from COVID-19, there would need to be some method of identifying the more severely affected individuals. Before modifying public health policy, the findings of this study should be confirmed by larger studies in a range of different populations, as the implications for public health services could be significant.

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Conflict of Interest

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

Compliance with Ethical Statement

Izmir Democracy University Non-Interventional Clinical Research Ethics Committee approved this study (decision date: 03/11/2021, number: 2021/14-02).

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