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INVESTIGATION OF PERSISTENT POST-COVID-19 SYMPTOMS, FRAILTY, KINESIOPHOBIA, AND QUALITY OF LIFE IN OLDER ADULTS: AN OBSERVATIONAL CROSS-SECTIONAL STUDY

ORIGINAL ARTICLE

ABSTRACT

Purpose: The aim of this study was to compare kinesiophobia and quality of life in older adults among subgroups created according to persistent post-COVID-19 symptoms and frailty.

Methods: This study included 63 adults over the age of 65 with COVID-19. Frailty was assessed with the Clinical Frailty Scale (CFS). Tampa Scale of Kinesiophobia (TSK) was used to assess the kinesiophobia and The World Health Organization Quality of Life Instrument-Older Adults Module (WHOQOL-OLD) was used to assess quality of life.

Results: The TSK score was significantly higher in the visibly frail and frail group than in the non-frail group (p=0.040). The TSK score was also significantly higher in the group with at least one persistent symptom after COVID-19 than participants with no persistent symptoms (p=0.008). Among participants with at least one persistent post-COVID-19 symptom, the TSK score was significantly higher in those with persistent dyspnea compared to those without (p=0.016). There was no significant difference in the WHOQOL-OLD scores of any sub-groups (p>0.05).

Conclusion: The results of the study showed that kinesiophobia was affected by the presence of persistent COVID-19 symptoms and dyspnea, and frailty in older adults. In addition, quality of life was found to be independent of frailty and persistent COVID-19 symptoms.

Keywords: Elderly, Frailty, Post-acute COVID-19 Syndrome, Quality of Life

YAŞLI YETİŞKİNLERDE COVID-19 SONRASI KALICI SEMPTOMLAR, KIRILGANLIK, KİNEZYOFOBİ VE YAŞAM KALİTESİNİN İNCELENMESİ: GÖZLEMSEL KESİTSEL BİR ÇALIŞMA

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışmanın amacı, yaşlı yetişkinlerde kinezyofobi ve yaşam kalitesinin COVID-19 sonrası kalıcı semptomlara ve kırılganlığa göre oluşturulan alt gruplar arasında karşılaştırılmasıydı.

Yöntem: Çalışmaya 65 yaşın üzerinde, COVID-19'lu 63 yetişkin dahil edildi. Kırılganlık, Klinik Kırılganlık Skalası (KKS) ile değerlendirildi. Tampa Kinezyofobi Skalası (TKS) kinezyofobiyi değerlendirmek için ve Dünya Sağlık Örgütü Yaşam Kalitesi Enstrümanı-Yaşlı Yetişkinler Modülü (DSÖYKE-YYM) yaşam kalitesini değerlendirmek için kullanıldı.

Sonuçlar: TKS skoru görünürde kırılgan ve kırılgan olan grupta kırılgan olmayan gruba kıyasla anlamlı şekilde daha yüksekti (p=0,040). TKS skoru ayrıca, COVID-19 sonrası en az bir kalıcı semptomu olan grupta hiç semptomu olmayan gruba kıyasla anlamlı şekilde daha yüksekti (p=0,008). COVID-19 sonrası en az bir kalıcı semptomu olan grup içerisinde TKS skoru kalıcı dispnesi olanlarda olmayanlara kıyasla anlamlı şekilde daha yüksekti (p=0,016). DSÖYKE-YYM skorunda hiçbir alt grup arasında anlamlı fark yoktu (p>0,05).

Tartışma: Çalışmanın sonuçları, COVID-19'lu yaşlı bireylerde kinezyofobinin COVID-19 sonrası kalıcı semptom ve nefes darlığı varlığı ile kırılganlıktan etkilendiğini gösterdi. Ayrıca yaşam kalitesinin, kırılganlık ve COVID-19 sonrası kalıcı semptomlardan bağımsız olduğu bulundu.

Anahtar Kelimeler: Yaşlı, Kırılganlık, Post-akut COVID-19 Sendromu, Yaşam Kalitesi

INTRODUCTION

Although coronavirus (SARS-CoV-2) infection can progress with severe acute respiratory syndromes in all age groups, the burden of disease is relatively higher in people aged 65 years and over (1). More than one comorbidity accompanying COVID-19 infection in older adults has been associated with worsen prognosis and prolonged recovery time (2). The World Health Organization (WHO) has reported the recovery time from COVID-19 to be approximately 2 weeks in the presence of mild infection and between 3 and 6 weeks in more severe infections (3). Post-acute COVID-19 syndrome is defined as the persistence of symptoms for more than three weeks from the onset of the first symptoms. The situation in which the symptoms continue for 12 weeks or more is defined as chronic COVID-19 syndrome and the symptoms are expressed as persistent post-COVID-19 symptoms (4). While the majority of the infected patients recovered completely, it was observed that some of the symptoms of a significant part of the patients continued after the first recovery period of the disease. Dyspnea, muscle and joint pain, fatigue, cough and fever are the most common persistent symptoms. (5, 6). Tosato et al. reported that 83% of 137 older adults had at least 1, and 46.3% of them had 3 or more persistent post-COVID-19 symptoms (7). The authors stated that dyspnea, cough, fatigue, and joint pain were the most commonly reported persistent symptoms.

Age-related frailty is a clinical disorder that reduces the functioning of multiple organ systems, causes loss of homeostasis, and consequently renders the elderly person highly vulnerable to minor stressors (8). Frailty was associated with a higher rate of hospital mortality, days of hospital stay, admission to the intensive care unit, and the need for mechanical ventilation support, independent of the older age. (9). It has been reported that even younger individuals with COVID-19 had much more vulnerability and multimorbidity (10). In addition to increasing the risk of hospitalization, admission to the intensive care unit and death, which are the direct effects of COVID-19, the indirect effects of social isolation applied during the pandemic period such as malnutrition, physical inactivity, depression and anxiety also play a role in worsening frailty (10).

The condition caused by frailty, debilitating physical movements and causing an excessive and irrational fear of activity is defined as kinesiophobia. (12). Decreased physical activity level with the effect of social isolation and frailty has a negative relationship with fear of movement (13). Recent studies have reported a strong relationship between dyspnea and kinesiophobia in individuals with chronic obstructive pulmonary disease (COPD) (14, 15). However, as far as we know, there is no study investigating the relationship between dyspnea, one of the most common persistent post-COVID-19 symptom, and kinesiophobia. It has also been reported that frailty, which is seen at a high rate in older adults, increases kinesiophobia by worsening symptoms and restricting physical function (16). In addition, it has been shown that kinesiophobia, dyspnea, and limitation of movement can reduce quality of life in frail older adults (17).

Considering the direct relationship of kinesiophobia with frailty, the impact of persistent post-COVID-19 symptoms in older adults on kinesiophobia is not yet known. In addition, although it is known that quality of life can be affected by both frailty and symptoms such as dyspnea, pain, and fatigue, there has been no study focusing on the effects of persistent post-COVID-19 symptoms on quality of life in older adults. The aim of this study was to compare kinesiophobia and quality of life in older adults with COVID-19 among subgroups according to persistent post-COVID-19 symptom and frailty.

METHOD

This study was conducted as an observational cross-sectional study between January and June 2022. This study protocol was approved by the Ethical approval was obtained from Ethical Committee of Biruni University (Protocol Number 2022/68-16) and required permission were got from Turkish Ministry of Health. Sixty-three older adults over the age of 65 who had COVID-19 were included in the study. Since the presence of symptoms longer than 12 weeks is considered persistent post-COVID-19 symptoms; the symptoms present for at least 12 weeks from the onset were classified as persistent post-COVID-19 symptom. The inclusion criteria

were being 65 years or older who were diagnosed as COVID-19 based on a positive SARS-CoV-2 real-time reverse transcriptase-polymerase chain reaction (RT-PCR) on nasal swabs, able to understand and speak the national language and being volunteer to participate in the study. Subjects who have been diagnosed with a psychiatric or neurological disorder that may cause cognitive impairment and no access to high speed internet were excluded from the study. All assessments were completed using the tele-assessment method.

Physical and sociodemographic characteristics of the participants were recorded. Time after positive RT-PCR test, persistent post-COVID-19 symptoms (dyspnea, fatigue, joint pain, cough, fever, headache, vomiting, diarrhea etc.), history of smoking, and comorbidities were also recorded.

The frailty level of the participants was assessed with the Clinical Frailty Scale (CFS). The CFS evaluates activities of daily living and comorbid conditions, and 1 point represents very fit individuals and 9 points represents highly frail individuals (terminal patients, individuals with a life expectancy of less than 6 months) (18). According to the Clinical Frailty Scale; participants with a score of 0-4 were classified as non-frail, participants with a score of 5-6 were classified as seemingly defenseless or participants with a score of 7-9 were classified as frail. The Turkish version of the CFS used in this study (19).

Kinesiophobia was assessed with the Tampa Scale of Kinesiophobia (TSK). The TSK is a self-report questionnaire consisting of 17 items and each item is evaluated with a 4-point Likert scale. The scale is based on a model of fear of movement, work-related activities, and re-injury. Participants answered all items between 0 and 4 points, with answers ranging from "strongly disagree" to "strongly agree". In total, the lowest 17 and the highest 68 points can be obtained, and a higher score indicates a higher degree of kinesiophobia. Vlaeyen et al. calculated the cutoff value of the scale as 37 points and found that scores above this point indicated high level of kinesiophobia (20). The Turkish version of the TSK used in this study (21).

The quality of life was assessed with the World Health Organization Quality of Life Instrument-Older Adults Module (WHOQOL-OLD). WHOQOL-OLD is a 5-point Likert-type scale and consists of 6 subscales and 24 items. High scores obtained from the scale indicate a better quality of life (22). The Turkish version of the WHOQOL-Old used in this study (23).

The study was approved by the Ethics Committee with the protocol number 2022/68-16. The study was conducted in accordance with the principles of the Declaration of Helsinki. All participants were included in the study after obtaining written informed consent.

Statistical Analysis

The calculation of the sample size of the study was conducted with The G*Power 3.1 program. The sample size calculation was made on the result of a study with 80% power and 0.75 effect size (two tailed; α=0.05) that investigating the effect of kinesiophobia on health-related quality of life in elderly individuals with COPD (24), and we estimated that a total of at least 62 participants should be included in the present study.

IBM SPSS v.26 (SPSS Inc., USA) was used for all statistical analysis. The normality of the distribution of data was analyzed using Kolmogorov-Smirnov, Lilliefors and Shapiro-Wilk Test. Independent Samples t test and Mann Whitney U test were used for comparisons between groups, depending on the distribution characteristics of the data. Independent Samples T-test was used for the comparison of normally distributed data between groups, and the Mann-Whitney U test was used for the comparison of data that did not show normal distribution between groups. Categorical variables between groups were compared with the Chi-square test. $p<0.05$ was accepted as the significance value for the results.

RESULTS

A total of 88 older adults with COVID-19 were assessed in terms of eligibility in the study. Twenty-five participants who had cognitive, psychiatric or neurological disorders were not included in the study. Sixty-three participants (36 female, 27 male) were enrolled in the study. Demographics and clinical characteristics of the participants were shown in Table 1. The mean duration of per-

sistent post-COVID-19 symptoms that started and continued after the patients were diagnosed was approximately 37 weeks (262.33 ± 162.67; [Minimum:30,00 - Maximum: 669.33] days). The scores of frailty, kinesiophobia and quality of life of the participants were shown in Table 2. According to the CFS, 68.25% of the participants (n = 43) were non-frail (0 ≤ CFS ≤ 4); 28.8% of the participants (n = 15) were seemingly defenseless (5 ≤ CFS ≤ 6) and 7.9% of the participants (n = 5) were frail (7 ≤ CFS ≤ 9). There was no significant difference between the mean ages of the non-frail group and the seemingly defenseless or frail group (71.32 ± 5.03; 74.85 ± 6.87; respectively, p > 0.05).

Table 1. Demographics and Clinical Characteristics of the Participants

	Mean ± SD (n=63)
Age (years)	73.39 ± 6.40
Gender	
Female (n)	36 (57.14%)
Male (n)	27 (42.85%)
BMI (kg/m²)	23.4 ± 3.5
Smoking	
Non-smoker (n)	33 (52.38%)
Ex-smoker (n)	21 (33.33%)
Active-smoker (n)	9 (14.28%)
Comorbidities	
Hypertension (n)	42 (66.66%)
Diabetes (n)	30 (47.61%)
Hyperlipidemia (n)	10 (15.87%)
Asthma	7 (11.11%)
Coronary artery disease (n)	2 (3.17%)
Chronic obstructive pulmonary disease (n)	2 (3.17%)
Bronchitis (n)	2 (3.17%)
Regular use of prescribed (n)	56 (88.88%)
Time after RT-PCR test (days)	262.33 ± 162.67
History of hospitalization due to COVID-19	
Yes (n)	9 (14.3%)
No (n)	54 (85.7%)
Hospital Length of Stay (days)	5.60 ± 2.25
History of staying in intensive care	
Yes (n)	0
No (n)	63 (100%)
History of outpatient treatment	
Yes (n)	0
No (n)	63 (100%)
Persistent Post-COVID-19 Symptoms	
Yes (n)	41 (65.07%)
No (n)	22 (34.92%)
Type of Persistent Post-COVID-19 Symptoms	
Dyspnea	33 (79.4%)
Joint pain	14 (34.9%)
Fatigue	9 (21.95%)
Cough	8 (19.0%)
Headache	6 (14.63%)
Loss of smell	5 (12.91%)
Loss of taste	3 (7.31%)
Weight loss	2 (4.87%)
Sleep disorder	2 (4.87%)

Note: Data are presented as mean ± standard deviation or n (%).

Abbreviations: BMI: body mass index, RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

Table 2. The Scores of Frailty, Kinesiophobia and Quality of Life of the Participants

	Mean ± SD (n=63)
Clinical Frailty Scale Score	3.88 ± 1.51
Non-frail (0-4 points) (n; %)	43 (68.25%)
Seemingly defenseless (5-6 points) (n; %)	15 (28.8%)
Frail (7-9 points) (n; %)	5 (7.9%)
Tampa Scale of Kinesiophobia Score	42.57 ± 6.77
WHOQOL-OLD Score	74.47 ± 8.64

Note: Data are presented as mean ± standard deviation or n (%).
Abbreviations: WHOQOL-OLD: The World Health Organization Quality of Life Instrument-Older Adults Module.

Table 3. Comparison of the Tampa Scale of Kinesiophobia Score of the Participants According to Clinical Frailty Scale Score, Time after COVID-19, and Presence of Persistent Symptoms

Variables	Tampa Scale of Kinesiophobia Score	p	95% Confidence Interval	
			Lower	Upper
Clinical Frailty Scale Score				
Non-frail (n=43)	41.46 ± 7.04	**0.040**	-6.805	-0.164
Seemingly defenseless or frail (n=20)	44.95 ± 5.59			
Time after RT-PCR test (days)				
< 3 months (n=13)	43.53 ± 7.70	0.729	-9.296 -2.707 -4.810	10.123 7.403 5.601
3 - 6 months (n=8)	43.12 ± 10.96			
6 - 12 months (n=21)	41.19 ± 5.11			
> 12 months (n=21)	43.14 ± 5.92			
Persistent Post-COVID-19 Symptoms				
Yes (n=41)	44.29 ± 6.07	**0.008**	-8.499	-1.358
No (n=22)	36.00 ± 6.97			
Persistent Dyspnea				
Yes (n=33)	46.07 ± 5.02	**0.016**	-7.921	-0.912
No (n=30)	41.66 ± 6.97			
Joint pain				
Yes (n=22)	44.13 ± 6.10	0.164	-5.828	1.019
No (n=41)	41.73 ± 7.03			
Fatigue				
Yes (n=9)	44.00 ± 5.47	0.433	-6.121	2.787
No (n=54)	42.33 ± 6.98			

Note: Data are presented as mean ± standard deviation.
Abbreviations: RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

Comparison of the Tampa Scale of Kinesiophobia score of the participants according to frailty, time after COVID-19, and presence of highly reported persistent symptoms (dyspnea, joint pain and fatigue) were shown in Table 3. The Tampa Scale of Kinesiophobia score was significantly higher in the participants seemingly defenseless or frail group than in the non-frail group (p = 0.040). No significant difference observed in the Tampa Scale of Kinesiophobia score between the subgroups separated by time after positive RT- PCR (p > 0.05). The Tampa Scale of Kinesiophobia score was also significantly higher in the participants with at least one persistent post-COVID-19 symptom than par-

Table 4. Comparison of the WHOQOL-OLD Score of the Participants According to Clinical Frailty Scale Score, Time after COVID-19, and Presence of Persistent Symptoms

Variables	WHOQOL-OLD Score	p	95% Confidence Interval	
			Lower	Upper
Clinical Frailty Scale Score				
Non-frail (n=43)	75,60 ± 8,93	0.111	-0.851	7.960
Seemingly defenseless or frail (n=20)	72,05 ± 7,63			
Time after RT-PCR test (days)				
< 3 months (n=13)	76,69 ± 8,31			
3 - 6 months (n=8)	72,50 ± 5,83	0.706	-2.290 -4.104	10.675 8.251
6 - 12 months (n=21)	74,61 ± 8,87		-3.426	9.382
> 12 months (n=21)	73,71 ± 9,70			
Persistent Post-COVID-19 Symptoms				
Yes (n=41)	74.54 ± 10.39	0.967	-5.017	5.230
No (n=22)	74.43 ± 7.68			
Persistent Dyspnea				
Yes (n=33)	74.23 ± 9.25	0.914	-5.662	6.280
No (n=30)	74.54 ± 8.57			
Joint pain				
Yes (n=22)	74.54 ± 7.81	0.962	-4.516	4.303
No (n=41)	74.43 ± 9.15			
Fatigue				
Yes (n=9)	70.44 ± 4.41	0.093	0.721	8.685
No (n=54)	75.14 ± 9.01			

Note: Data are presented as mean ± standard deviation.
Abbreviations: RT-PCR: real-time reverse transcriptase-polymerase chain reaction.

ticipants without persistent post-COVID-19 symptom (p = 0.008). Among participants with at least one persistent post-COVID-19 symptom, the Tampa Scale of Kinesiophobia score was significantly higher in those with persistent dyspnea compared with those without persistent dyspnea (p = 0.016). There was no significant difference in the Tampa Scale of Kinesiophobia score between the groups regarding to joint pain or fatigue (p > 0.05).

Table 4 showed the comparison of the WHOQOL-OLD score of the participants according to Clinical Frailty Scale score, time after COVID-19, and presence of at least one persistent post-COVID-19 symptom. There were no significant differences in WHOQOL-OLD score between any subgroups (p > 0.05).

DISCUSSION

In the present study, it has been shown that kinesiophobia was significantly higher in the seemingly defenseless or frail older adults compared to the non-frail older adults. In addition, seemingly defenseless or frail older adults were tend to report at least one persistent post-COVID-19 symptom compared to non-frails. Among the most common persistent post-COVID-19 symptoms, presence of joint pain and fatigue did not make a significant difference while the presence of persistent dyspnea increased the kinesiophobia.

Among the changes brought about by aging, the decrease in independence, physical activity and functional capacity, social isolation, and the increase in rates of morbidity and mortality due to all these are among the most challenging problems that individuals have to deal with (25). Frailty is defined as a syndrome that results in decreased

functionality and mobility, which may occur as a result of multiple factors including decline of muscle mass, physical activity, and performance in older adults (26). The COVID-19 pandemic has brought massive morbidity, mortality, and unprecedented problems all over the world, and older adults at high risk of developing serious complications after COVID-19 have been advised to follow strict isolation guidelines to minimize their risk during the pandemic (27). Mishra et al. compared the mobility before and during the pandemic and found that the practices during the pandemic significantly reduced the mobility of older adults (28). Since it is known that decreased mobility increases frailty (29), it is possible to say that there may be a relationship between decreased physical activity and increased frailty, although as far as we know there is no study that evaluating the frailty of older adults during the pandemic. The vicious cycle between decreased mobility and kinesiophobia is shown as one of the possible causes of higher kinesiophobia in older adults (30). In our study, the kinesiophobia score was found to be higher in the seemingly defenseless or frail participants compared to non-frail participants, in line with the relationship between frailty and kinesiophobia reported in the literature.

A new term, defined as Long-COVID, has emerged in COVID-19 patients, in which symptoms begin during the hospitalization period and continue even after 1 year (31). Consistent with the literature, more than half of the participants in our study had more than 6 months after COVID-19 and had persistent post-COVID-19 symptoms. In a prospective study, Wu et al. reported that despite the elapsed time in their evaluation at the 3rd, 6th, 9th, and 12th months in COVID-19 patients, there were persistent physiological and radiological changes and the symptoms continued (32). Our findings showed that the time after COVID-19 did not make any difference in kinesiophobia and quality of life. Since it is known that the persistent changes and symptoms caused by COVID-19 start in the early period and continue in the long term, we think that it is acceptable that the time after COVID-19 does not make a significant difference.

Previous studies have shown that pain has a direct relationship with kinesiophobia because it limits physical activity, functional capacity, and mobility (33, 34). Dyspnea and pain are defined as subjective experiences and multifactorial mechanisms are known to play a role in their occurrence (34). Considering that common cortical areas and nerve pathways are involved in the perception of pain and dyspnea, it can be said that the mechanism of dyspnea-related kinesiophobia is similar to the mechanisms of pain-related kinesiophobia (35). A limited number of studies have investigated the relationship between dyspnea and kinesiophobia in patients with COPD (14, 36) and patients with chronic respiratory diseases (37). Supporting the results of these studies showing that there is a strong relationship between dyspnea and kinesiophobia, the kinesiophobia score was found to be higher in participants with persistent dyspnea compared to participants without persistent dyspnea.

Considering the association of kinesiophobia with age-related morphological changes and also its association with symptoms such as dyspnea and pain, it is very difficult to determine the main factors causing kinesiophobia. Larsson et al. found that the kinesiophobia score was high in individuals over the age of 65 with only pain, and the kinesiophobia score was low in individuals over the age of 65 without pain (38). In addition, the authors reported that the kinesiophobia score did not change in individuals over the age of 65 who had no pain at 12-month follow-up. As a result, they stated that kinesiophobia may have been associated with pain rather than age-related physiological changes. In a study by Kocjan and Knapik, the effect of determining factors such as age, gender, health status, and psychological status on the level of kinesiophobia in young-old adults was examined and it was shown that psychological factors have a greater effect on kinesiophobia than biological factors (39). In accordance with the literature, the relationship between kinesiophobia and factors such as dyspnea and pain was shown in older adults in our study. Although the majority of the individuals included in the study had mild COVID-19, persistent post-COVID-19 symptoms may have played a larger role in kinesiophobia than age-related factors.

Recent 2 meta-analyses reviewed studies showing a negative relationship between frailty and quality of life in older adults (40, 41). The authors

stated that there were results showing that frailty and quality of life were associated in the studies which were included the meta-analyses, however, the mechanisms of this association could not be explained. In addition, it has been reported that poor quality of life in the frail older adults may be associated with a history of frequent falls, reduced functional capacity and muscle strength, and lack of family support (40). In the results of our study, unlike the literature, there was no difference between the quality of life in frail and non-frail participants. One of the weaknesses of our study, but the nature of our methodology, which prevents us from discussing the reasons for the similar quality of life as the failure to assess the participants' fall, functional capacity, strength, and family support.

Garrigues et al., assessed the quality of life of 120 older adults with COVID-19 whose symptoms persisted after 100 days or more after discharge and stated that the most common symptoms were dyspnea and fatigue. The authors found that despite the persistent symptoms, the patients' quality of life did not deteriorate, and the majority of patients were able to return to work and professional activities (42). In a meta-analysis on quality of life with post-acute COVID-19 syndrome, the participants of the included studies consisted of older adults with a mean age of 58.75 years. The reviewed studies also showed that the most common persistent symptoms were fatigue and dyspnea. The authors stated that the quality of life deteriorated mostly in patients with a history of intensive care, and stated that low quality of life was mostly associated with pain, anxiety, depression and mobility. However, they also reported that there was no certain result due to the insufficient evidence (43). Similarly, in our study, the most common persistent symptoms were dyspnea and fatigue, and there was no difference in quality of life participants with persistent symptoms compared to participants without persistent symptoms. Our results may be related to the fact that none of our participants had a history of intensive care, very few of them had a history of hospitalization, and the length of hospital stay was relatively low.

There are some limitations and future recommendations to this study. Considering that kinesiophobia is mostly associated with mobility and physical activity, and quality of life is mostly associated with anxiety and depression, the absence of these assessments in our study is one of our limitations. Another limitation of the present study is that when the participants were divided into two groups as frail and non-frail, the number of people in the groups was not relatively close to each other. Another important limitation is that the majority of the individuals included in our study had mild COVID-19 and the number of individuals with moderate and severe COVID-19 was small. For all these reasons, we think that comparing the sub-groups with more equal numbers and evaluating mobility, anxiety, and depression in future studies may add a different perspective to the results. In addition, future studies that include individuals with moderate and severe COVID-19 will be beneficial for generating results.

In conclusion, the results of our study showed that frailty, persistent post-COVID-19 symptoms and persistent dyspnea among these symptoms are factors that increase kinesiophobia in older adults with COVID-19. The fact that the time after COVID-19 did not make a difference shows that it is important to evaluate the presence of persistent COVID-19 symptoms and the kinesiophobia in both the early and late periods of the older adults.

Sources of Support: None.

Conflict of Interest: The authors report no conflict of interest.

Ethical Approval: This study protocol was approved by the Ethical approval was obtained from Ethical Committee of Biruni University (Protocol Number 2022/68-16) and required permission were got from Turkish Ministry of Health.

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