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THE RELATIONSHIP BETWEEN KINESIOPHOBIA, PHYSICAL PERFORMANCE AND BALANCE IN LOWER EXTREMITY LYMPHEDEMA PATIENTS

ORIGINAL ARTICLE

ABSTRACT

Purpose: Lymphedema is an important situation that causes physical and psychological life-threatening problems. This study researches kinesiophobia in lower extremity patients and scrutinizes the relationship between kinesiophobia, physical performance and balance.

Methods: This cross-sectional controlled study included 40 individuals diagnosed with lower extremity lymphedema with a mean age of 42.58±10.30 years and 31 healthy individuals with a mean age of 40.65 ± 9.53 years. The evaluation of patients with unilateral lymphedema without cognitive and visual problems and those without orthopedic and neurological disorders that would prevent walking and those without heart disease and hypertension was carried out between November 2018 and March 2019. Static balance was evaluated with standing on One leg Balance Test, fear of movement was evaluated with Tampa Scale Kinesiophobia and functional levels were evaluated with Timed Up and Go test.

Results. Static balance and physical performance of lower extremity lymphedema patients were different from healthy individuals ($p<0.05$). Static balance and physical performance were lower in these patients than in healthy individuals. Patients with lower extremity lymphedema had a severe fear of movement (37 and above). There was a significant moderate correlation between kinesiophobia and balance ($r= -0.536$ $p= 0.001$), kinesiophobia and physical performance ($r= 0.522$ $p= 0.001$) in lower extremity lymphedema patients. And this correlation was more in healthy individuals.

Conclusions: High fear of movement and decreased physical performance and balance were found in patients with lower extremity lymphedema. Early diagnosis and treatment of complications due to lymphedema is important for the clinical results of this patient group.

Keywords: Kinesiophobia, Lymphedema, Physical Performance, Static Balance.

ALT EKSTREMITE LENFÖDEM HASTALARINDA KİNEZYOFOBI, FİZİKSEL PERFORMANS VE DENGE ARASINDAKI İLİŞKİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Lenfödem, fiziksel ve psikolojik yaşamı tehdit eden sorunlara neden olan önemli bir durumdur. Bu çalışma, alt ekstremite hastalarında kinezyofobiyi araştırmakta ve kinezyofobi, fiziksel performans ve denge arasındaki ilişkiyi incelemektedir.

Yöntem: Bu kesitsel kontrollü çalışmaya, yaş ortalaması 42,58±10,30 yıl olan alt ekstremite lenfödem tanısı konan 40 kişi ve yaş ortalaması 40,65 ± 9,53 yıl olan 31 sağlıklı birey dahil edildi. Tek taraflı lenfödemi bulunan ve bilişsel ve görsel sorunu olmayan, yürümeyi engelleyecek ortopedik ve nörolojik bozukluğu olmayan, kalp hastalığı ve hipertansiyonu olmayan hastaların değerlendirilmesi Kasım 2018-Mart 2019 tarihleri arasında yapıldı. Statik denge tek ayak üzerinde durma testi ile hareket korkusu Tampa Kinezyofobi Ölçeği ile, fonksiyonel düzeyleri ise Zamanlı Kalk Yürü Testi ile değerlendirildi.

Sonuçlar: Alt ekstremite lenfödem hastalarının statik dengesi ve fiziksel performansı sağlıklı bireylerden farklıydı ($p<0,05$). Bu hastalarda statik denge ve fiziksel performans sağlıklı bireylere göre daha düşüktü. Alt ekstremite lenfödemli hastalarda şiddetli hareket korkusu vardı (37 ve üzeri). Alt ekstremite lenfödem hastalarında kinezyofobi ile denge ($r= -0,536$ $p= 0,001$), kinezyofobi ve fiziksel performans ($r= 0,522$ $p= 0,001$) arasında orta düzeyde anlamlı bir ilişki vardı. Bu korelasyon sağlıklı bireylerde daha fazlaydı.

Tartışma: Alt ekstremite lenfödemli hastalarda yüksek hareket korkusu, fiziksel performans ve dengede azalma bulundu. Lenfödeme bağlı komplikasyonların erken teşhisi ve tedavisi bu hasta grubunun klinik sonuçları açısından önemlidir.

Anahtar Kelimeler: Kinezyofobi, Lenfödem, Fiziksel Performans, Statik Denge.

INTRODUCTION

Lymphedema is a chronic, progressive and debilitating condition that occurs with the accumulation of protein-rich fluid in interstitial tissue spaces as a result of abnormal development or damage of the lymphatic system (1,2). The most frequent symptoms in lower extremity lymphedema are cosmetic deformities, sensory deformities, an inclination to infections, fatigue, decreased joint range of motion, and fullness feeling due to edema (3,4). It is a known fact that if lymphedema is not treated, it will deteriorate (5). In lower extremity lymphedema patients, if the condition gets chronic, loss of strength and musculoskeletal pain will appear (6).

When any part of your body is exposed to injury or trauma, caused pain restricts the ability to move. Fear of movement even after recovery is described as kinesiophobia (7). Kinesiophobic patients often refrain from activities in case symptoms will show up or even deteriorate, thus it may affect their functionality negatively (8). There are studies in the literature evaluating the fear of movement in patients with lymphedema (9-11) Lymphedema patients refrain from using their affected extremities. If patients use the affected extremities, they believe that lymphedema will deteriorate and it will restrict their joint mobility, and it will increase the severity of edema. The severity of edema has a negative effect on the fear of activity in lymphedema patients (10). There are also various studies evaluating kinesiophobia after lower extremity injuries (12-14). Studies have shown that injured people have higher kinesiophobia than healthy individuals (12,13). Various complications, especially pain, have been reported to cause movement avoidance behavior (14).

In one study evaluating the fear of movement in patients with lower extremity lymphedema, it was reported that lymphedema patients had higher fear of movement together with decreased quality of life and physical performance (11). Poor quality of life and decreased mobility may create a fear of movement and injury in individuals and may lead to a tendency to avoid activity.

In literature, there are limited studies that show significant physical performance decrease in lower extremity lymphedema patients (3,15). It is indicated that functionality has decreased 30% in this patient group (15). It is mentioned that the clinical progress of lymphedema has a negative effect on functionality with aging and deterioration of the disease.

Another condition which concerns lower extremity functionality is balance. Disorder in balance and decrease in mobility cause their life quality to decrease by negatively affecting physical performance and creating inabilities in the daily activities of the patients (16).

It has been shown that the loss of joint mobility and developing asymmetry affect balance in different lower extremity pathologies (17-19). Evidence-based studies to evaluate and improve symptoms such as decreased range of motion, loss of muscle strength, and pain in patients with lower extremity lymphedema have been extensively found, while postural balances resulting from symptoms, which are important for lower extremity functionality, have not been evaluated. Within our knowledge, a study that evaluates balance with lower extremity lymphedema patients does not exist in the literature. Balance is thought to be affected, depending on complications such as an increase in volume, heavily feeling extremity, and feeling fullness.

In line with this information, in this study, it was aimed to examine the relationship between kinesiophobia, physical performance and balance in patients with lower extremity lymphedema, with the assumption that kinesiophobia may affect functionality and postural balance.

METHODS

This study was designed as a cross-sectional study. This research was carried out in Istanbul University Cerrahpaşa Medical Faculty Hospital Physical Medicine and Rehabilitation Department Lymphedema Unit between November 2018 and March 2019 to evaluate fear of movement, physical performance and balance in patients with lower extremity lymphedema. This research is confirmed by the Üsküdar University Noninvasive Ethical Committee at the meeting which was conducted on 25/10/2018 and approval number is 2018-870. This study was carried out in accordance with Hel-

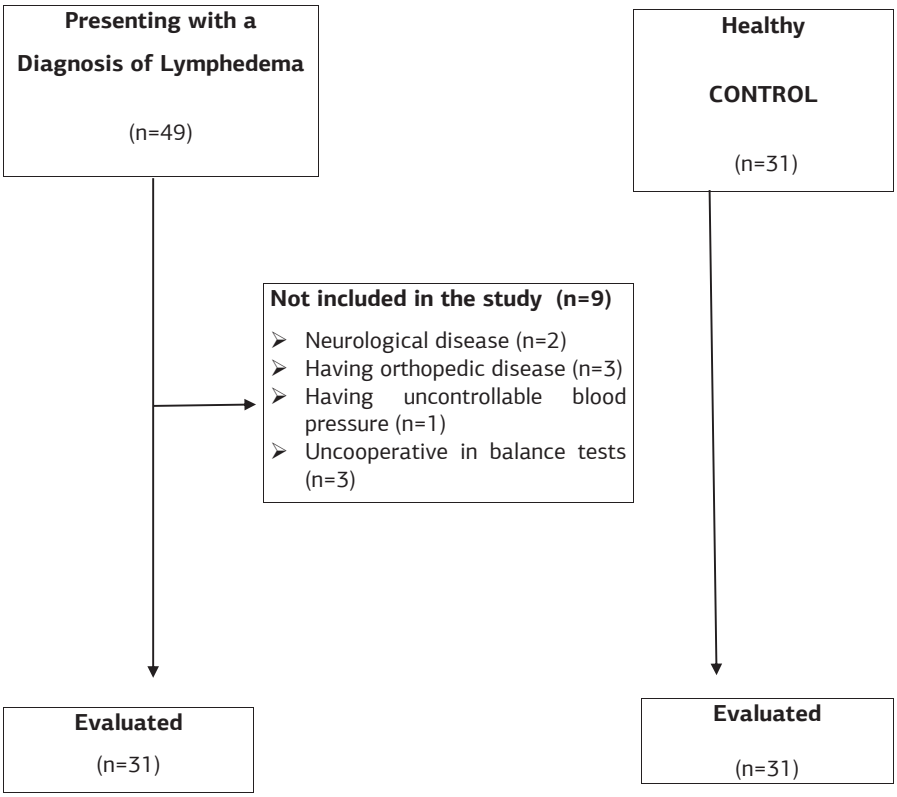

Figure 1. Flow Chart of the Participants

sinki principles. Informed consent is obtained from every participant. Sample size calculation was performed using the G* Power version 3.1.9.2 software (Heinrich-HeineUniversität Düsseldorf, Düsseldorf, Germany). In the structured sample size analysis, the alpha meaning level (Type I error; α=0.05) was the power value which was required for this study (Type II error; ie β=0.90). A | ρ | = 0.50 effect size value which was accepted as a high effect width according to the Cohens standards was calculated.16 As a result of these variables, in order to find correlation in two groups and compare them in this study, the acquired minimum number of samples in only one group was calculated as 28 for patient and control group and in total minimum 56 individuals. The study was completed with 40 people in patient group, 31 people in healthy control group, and 71 individuals in total.

Forty patients (37 females, 3 males) aged between 19-63 years (42.58 ± 10.73 years) and 31 healthy volunteers (25 females, 6 males) aged between 20-63 years (40.65 ± 9.53 years) were included in the study. The individuals who have bilateral lymphedema, cognitive audial and visual problems, neurological and orthopedical disorders which hinder walking, heart disease and hypertension which can't be controlled, were excluded (20). Since bilateral lymphedema prevents functional tests, patients with unilateral lymphedema were included in the study. The flow chart of the individuals included in the study is shown in figure 1.

Demographic features of participants (age, height, body mass index, gender, dominant extremity) and information related to lymphedema (the severity of lymphedema, lymphedema diagnosis time, involvement side) were saved by using a standard form. The static balance of participants was evaluated with standing on One leg Balance Test, their fear of movement was evaluated with Tampa Scale Kinesiophobia (TSK) and their functional levels were evaluated with Timed Up and Go (TUG) test. Assessments were done by the same physiotherapist.

In order to determine the size of lower extremity edema, a circumferential measurement was done. All patients were rested in lying back position, and their extremity, which was in elevation, was

affected 30 minutes before circumferential measurement. Then, when the patients were at the position of half-sitting and their ankle was in a neutral position, a circumferential measurement was taken from the ankle medial malleolus line to the proximal axis at 5 cm intervals. The circumferential measurement taken from the ankle medial malleolus line to the proximal axis was at 5 cm intervals (21).

The obtained size of values was determined by using a truncated cone formula. Truncated cone formula (V=) [h x (R12+R1.R2+R22)] / (12 x π). V: the size of every conical segment, h: gap which was used during circumferential measurement. R1: Base circumferential measurement of the conical segment. R2: Upper circumferential measurement of the conical segment, VT: Leg size, n: conical segment number (21).

The severity of edema was classified as follows according to the volume difference between the two extremities (21):

Mild lymphedema; Difference between both extremities <250ml

Moderate lymphedema; Difference between both extremities 250-500ml

Severe lymphedema; Difference between both extremities >500ml

Kinesiophobia was assessed using the Turkish version of Tampa Scale for Kinesiophobia. The Turkish validity and reliability of the scale was already done (22). TSK is a 17-question scale that was developed with the intent of measuring the repetitive fear of movement injury. This scale includes the parameters of fear-evasion and injury, repetitive injury in work-related activity. A person scores between 17-68 points in total. On this scale, when a person's score is high, it shows that his fear of movement is severe. The total score was used in the study and the limit value was accepted as 37 for fear of high movement (23).

Physical Performance was evaluated with the TUG test. First, the test was demonstrated in practice to the patients. The patients were asked to stand up with no support from the chair, to walk at maximal speed for three m, to turn around another chair again with no support, and to sit back on the first chair. The test was repeated three times, and times of the test were averaged and recorded in seconds (24).

Static balance was evaluated with standing on One Leg Balance Test. The One Leg Balance test is often used to demonstrate functionality and is sensitive to clinical applications. It was measured with standing on one foot unaided by using stopwatch while arms are near torso as eyes open and eyes closed. In this test, time began when the patient lifted his foot from the ground and it ended when his foot touched the ground. Moving the foot was determined as reaching 60 seconds maximum time termination criteria and time was saved as seconds (25).

Statistical Analysis

Statistical analysis was performed using the IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). The conformity of the evaluated variables to normal distribution was examined visually with histograms and probability charts, and analytical method with Kolmogorov Smirnov test. Descriptive statistics were expressed as mean± standard deviation (SD), median, 25-75th percentile, and frequency (%). Normally distributed variables were analyzed by using Independent T-test and non-normally distributed data were analyzed by using Mann-Whitney U test. Spearman correlation used to for non-normally distributed coefficient scores. The correlation coefficient values were defined as follows: very strong correlation (≥0.8); moderately strong correlation (0.6-0.8); fair correlation (0.3-0.5), and poor correlation (≤0.3) (26). A p-value of <0.05 was considered as statistically significant.

RESULTS

The demographic characteristics of the patients with lower extremity lymphedema and control group and clinical characteristics of lymphedema patients are presented in Table 1. There was no significant difference between age, weight, height, and BMI averages of patients with lower extremity lymphedema and healthy individuals. This showed that the groups were distributed homogeneously (p> 0.05). The mean age of the lymphedema patient group was 42.58±10.73 years, the mean height was 161.88±7.08 cm, the mean weight was

Table 1. Demographic and Clinical Characteristics of Patients with Lower Extremity Lymphedema and Controls

Characteristics	Lymphedema Patients (n=40) (mean±SD)	Controls (n=31) (mean±SD)	p
Age (year)	42.58±10.73	40.65±9.53	0.413*
Gender			
Female/Male (%)	37(92.50) / 3 (7.50)	25 (80.25) / 6 (19.75)	0.264†
Height (cm)	161.88±7.08	162.87±6.83	0.314*
Weight (kg)	76.31±15.00	70.45±1.89	0.820*
Body Mass Index (kg/m^2)	29.01±5.72	26.43±3.72	0.493*
Lower Dominant Extremity			
Right/Left (%)	34(85.00) / 6(25.00)	23(74.25) / 8(25.75)	0.027
Affected Extremity			
Right / Left (%)	15(37.50) / 25(62.5)		
Affected Extremity (%)			
Dominant / Nondominant	14(35.00) / 26(65.00)		
Duration of lymphedema (year)	9.68±8.94		
Severity of Lymphedema (%)			
Mild	9 (22.50)		
Moderate	9 (22.50)		
Severe	22 (55.00)		
Etiology of lymphedema			
Primary	16 (40.00)		
Secondary	24 (60.00)		

SD= Standart deviation, n=The number of People.
*P > 0.05 using Independent Samples test.
†P > 0.05 using chi-square test.

76.31±15.00 kg, the mean body mass index was 29.02 ± 5.72 kg / m2 and was very close to the obesity limit. The mean age of the control group was 40.65 ± 9.53 years, the average height was 162.87 ± 6.83 cm, the average weight was 70.45 ± 12.89 kg, the average body mass index was 26.43 ± 3.72 kg / m2. (Table 1).

There was a significant difference between the patients with lower extremity lymphedema and healthy individuals in terms of static balance and physical performance (p< 0.001), (Table 2).

There was a significant correlation between kinesiophobia and balance (r= -0.536 p=0.001; r=-0.324 p=0.020) and kinesophobia and physical performance (r= 0.522 p=0.001) in lower extremity lymphedema patients. There was also a relationship between kinesiophobia and balance (r= 0.423 p=0.020; r= 0.465 p=0.010) and kinesiophobia and physical performance (r= 0.376 p= 0.037) in healthy individuals. The relationship in patients with lower extremity lymphedema was more than the relationship which was determined in healthy

Table 2. Comparison of Balance, Kinesiophobia and Physical Performance in Patients with Lower Extremity Lymphedema and Controls

	Lymphedema Patients Median (25-75th percentile)	Controls Median (25-75th percentile)	p
One leg stand test			
Open Eyes (sec)	50 (24-60)	56 (50-60)	0.001*
Close Eyes (sec)	7 (5-22)	44 (37.75-49)	0.001*
TSK	44 (39-48)	34 (32.25-40)	0.001*
TUG (sec)	9 (8-10)	7.5 (7-8)	0.001*

TSK= Tampa Scale Kinesiophobia, TUG= Timed Up and Go.
*P<0.05 using Mann-Whitney U test.

Table 3. The Correlation Between Kinesiophobia, Balance an Physical Performance in Patients with Lymphedema Lower Extremity Lymphedema and Controls

		TSK	
One leg stand test Open Eyes	**Lymphedema patients**	r= -0.536	p= 0.001*
	Controls	r= 0.423	p= 0.020*
One leg stand test Close Eyes	**Lymphedema patients**	r= -0.324	p= 0.041*
	Controls	r= 0.465	p= 0.010*
TUG	**Lymphedema patients**	r= 0.522	p= 0.001*
	Controls	r= 0.376	p= 0.037*

TSK= Tampa Scale Kinesiophobia, TUG= Timed Up and Go.
r= Spearman's correlation coefficient,
*P<0.05 using Spearman Correlations.

controls, (Table 3).

In lower extremity lymphedema patients, a fair correlation between age and fear of movement was found (r= 0.363 p= 0.021), a fair correlation between age and static balance was found (r= -0.469 p= 0.009; r= -0.505 p= 0.001), and a fair correlation between age and physical performance was found (r= 0.468 p= 0.002). In lower extremity patients, a poor correlation between body mass index and fear of movement (r= 0.298 p= 0.012), a fair correlation between body mass index and physical performance (r= 0.451 p= 0.003) and a fair correlation between body mass index and static balance open eyes was found (r= -0.314 p= 0.048). Once again, in lower extremity lymphedema patients, a fair correlation between lymphedema severity and static balance close eyes was found (r= -0.381 p= 0.015), no correlation was found between fear of movement and physical performance.

On the other hand, no correlation between lymphedema time of diagnosis and fear of movement, between static balance and physical performance was found, (Table 4).

Table 4. The Correlation Between Physical Characteristics and Findings Related to Lymphedema with Kinesiophobia, Balance and Physical Performance in Patients with Lower Extremity Lymphedema and Controls

	TSK	One leg stand test		TUG
		Open Eyes	Close Eyes	
Age				
Lymphedema patients	r= 0.363	r= -0.409	r= -0.502	r= 0.468
	p= 0.021*	p= 0.009*	p= 0.001*	p= 0.002*
Controls	r= 0.371	r= 0.092	r= 0.140	r= 0.372
	p= 0.040*	p= 0.629	p= 0.460	p= 0.039*
BMI				
Lymphedema patients	r= 0.298	r= -0.314	r= -0.263	r= 0.451
	p= 0.012*	p= 0.048*	p= 0.101	p= 0.003*
Controls	r= 0.160	r= 0.152	r= -0.024	r= 0.294
	p= 0.391	p= 0.421	p= 0.898	p= 0.108
Severty of Lymphedema	r= 0.141	r= -0.239	r= -0.381	r= -0.036
	p= 0.385	p= 0.138	p= 0.015*	p= 0.828
Duration of Lymphedema	r= 0.145	r= -0.018	r= 0.095	r= 0.087
	p= 0.371	p= 0.915	p= 0.561	p= 0.594

TSK= Tampa Scale Kinesiophobia, TUG= Timed Up and Go, BMI= Body Mass Index,
r= Spearman's correlation coefficient.
*P<0.05 using Spearman Correlations.

DISCUSSION

In this study investigating fear of movement, physical performance and balance in patients with lower extremity lymphedema, it was found that there was a high fear of movement and physical performance and balance decreased compared to healthy individuals. It was determined that there was a relationship between high fear of movement and physical performance and balance.

Lymphedema is an important situation that causes physical and psychological life-threatening problems and decreases life qualities by affecting individuals' lifestyles and functions. In order to prevent or decrease lymphedema progress, control disease symptoms, and decrease functional complications, an individual needs good care and a detailed evaluation (27).

Researching function losses depending on fear of movement in chronic course diseases especially like lymphedema has started to draw attention recently. Patients who have a severe fear of movement refrain from activity in case their symptoms often worsen or appear, thus this situation may affect their functionality in a negative way (11). In the literature, it was demonstrated that upper extremity lymphedema patients refrained from using their affected extremities. Patients' belief towards their lymphedema worsened when they used their affected extremity and caused an increase in edema severity and limitation to joint movement (10). Within our current knowledge, there is one study that evaluates fear of movement in lower extremity lymphedema patients (11). Like the results in this study, severe fear of movement and decreased functional situation was found in lower extremity lymphedema patients (11). This may be due to the concern that excessive movement may cause injury and the belief that the severity of edema will increase.

The presence of lower extremity lymphedema negatively affects many physical, functional and physiological parameters on individuals. Physical performance decreased 30% in this patient group. The decrease in physical performance of lower extremity lymphedema patients occurs due to advanced age, and it has a negative effect on this parameter and especially deterioration in the clinical course of lymphedema (15). In addition to this, it was demonstrated that physical performance had an important effect on psychosocial situations and quality of life (28). In different pathology, losses in physical performance are linked to kinesiophobia (17). In our study, we believe that the reason for low physical performance in lower extremity lymphedema patients was fear of movement. Patients with lower extremity lymphedema patients may limit their activities in case their lymphedema increases.

While there are extensive evidence-based studies to evaluate and improve symptoms such as decreased range of motion, loss of muscle strength, and pain in patients with lower extremity lymphedema, postural disturbances resulting from symptoms, which are important for lower extremity functionality, have not been evaluated. One of the original aspects of the study is that the balance was evaluated in patients with lower extremity lymphedema in this study. In different lower extremity pathologies, static influence occurs with progressing asymmetry and joint mobility loss. In Ozden et al.'s study, they stated that pain which appears following lower extremity burn injuries limited the range of motion and decreased balance with the loss of joint mobility (17). In literature, there are studies that link kinesiophobia with balance losses in different pathologies (29,30). Many other studies also showed that kinesiophobia significantly affected balance and mobility, and psychological factors should be considered while postural stability was evaluated (29,30). In this study, a decrease in static balance in patients with lymphedema may occur due to feeling the extremity heavy and full with the mass increase occurring in lower extremity resulting from lymphedema and due to fear of movement in patients.

In literature, age is the most important factor among risk factors in lymphedema occurrence (31). In Kiel and Rademacker's study, they indicated that the prevalence of lymphedema in three years was 56% in 55-year-old and older patients, 23% in younger patients (32). The average of the patients was spotted as 53.4 in our study. The relationship between fear of movement, physical performance and balance in lower extremity lymphedema patients showed a similarity in advanced age factors shown in the literature. In addition, it has been

known that BMI over 30kg/m2 is another important risk factor for lymphedema progression. However, some studies indicated that BMI even between 25-30 kg/m2 was a serious value for lymphedema progression (33). In our study, the BMI of the patients was spotted as 29.01±5.72. High BMI results depending on lymphedema of the patients were expected results. Besides, it is thought that due to the relationship between BMI, kinesiophobia, and functionality, fear of movement triggers obesity.

In this study, patients with lower extremity lymphedema were found to have a high fear of movement. A significant relationship was found between fear of movement and physical performance and balance. High fear of movement can be thought to trigger functionality and obesity in the future. Patients should be informed about these correlated findings.

There are some limitations and future recommends to this study. When the fear of movement is considered to be affected by mood dysregulation, not evaluating the parameters such as anxiety, depression, concern, and fear in this patient group is a limitation of this study. Another limitation to this study is that when the balance is thought to be both peripheral and central components, plantar pressure senses like vibration, soft touching, and two points discrimination are not evaluated. In addition, there are only three male patients who applied to the clinic in this study. We think that new studies to be conducted on only women or only men in future studies may bring different interpretations to the subject.

There are some strengths and aspects of this study. Since high fear of movement is a parameter that affects functionality, the relationship between kinesiophobia and physical performance and balance in patients with lower extremity lymphedema was investigated and found to be related in this study. In addition, the relationship between high fear of movement and BMI revealed that patients should be evaluated in terms of obesity. In this respect, we think that the study is both a guide and a reference for researchers.

In conclusion, in the data obtained from the study, it was found that the physical performances and static balances of the patients with lower extremity lymphedema were impaired and their fear of movement increased. High fear of movement affects functionality and balance. It is thought that early detection of patients at risk of developing kinesiophobia in patients with lower extremity lymphedema is an important issue in terms of changing treatment strategies and clinical significance of the study.

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Author Contributions: Concept – BP, YE, NSO, ŞT; Design – BP, YE, NSO, ŞT Supervision - BP, YE, NSO, ŞT; Resources- BP, YE; Materials- ŞT; Data Collection and/or Processing- BP, NSO; Analysis and/or Interpretation - BP, YE; Literature Research- BP, YE; Writing Manuscript - BP, YE, NSO; Critical Review - BP, YE.

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