RESEARCH ARTICLE

Kinesiophobia, physical activity levels and barriers in breast cancer patients, survivors, and healthy controls: A case-control analysis

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Abstract

Objective: To investigate kinesiophobia, physical activity levels and barriers to physical activity in women with breast cancer and breast cancer survivors.

Method: The case-control study was conducted at the Breast Clinic of Acıbadem Maslak Hospital, and the Department of Physiotherapy and Rehabilitation at Acibadem Mehmet Ali Aydinlar University, Turkey, from October 2021 to July 2022, and comprised patients with breast cancer in group A, breast cancer survivors in group B and healthy controls in group C. The primary outcome measures were physical activity levels, barriers to physical activity and kinesiophobia levels, while the secondary outcome measures were levels of anxiety, depression, fatigue and quality of life. Data was collected using standard tools. Data was analysed using SPSS 22.

Results: Of the 212 women, 70(33%) were in group A with mean age 50.71±11.30 years, 70(33%) in group B with mean age 47.64±9.85 years, and 72(34%) in group C with mean age 47.03±7.48 years. Group C had better physical activity levels, fatigue and quality of life scores than the other groups, but it had worse perceptions of physical activity and more individual, psychosocial and environmental barriers to physical activity compared to the other groups (p<0.05). Group A had more barriers to exercise related to fear of overall body pain, poor balance, fear of falling and fear of feeling worse post-exercise compared to the other groups (p<0.05). Group B subjects were more afraid that lymphoedema might be exacerbated if they exercised (p<0.05).

Conclusion: Women with breast cancer and breast cancer survivors had worse scores for physical activity levels, fatigue and quality of life compared to the healthy controls. All three groups had a variety of barriers to physical activity.

Keywords: Breast neoplasms, Healthy volunteers, Kinesiophobia. (JPMA 74: 1428; 2024)

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Introduction

Breast cancer (BC) is the most common type of cancer in women worldwide. Both the incidence and survival rate of the disease have increased in recent years. It is reported that one out of every eight women in industrialised Western countries will be diagnosed with BC at some point in their lives.[1] In Turkey, one out of every four women diagnosed with cancer are diagnosed with BC, with 25,249 women having been diagnosed with BC in 2022.[2] For this reason, BC is a significant public health issue in Turkey, and its treatment and reduction of possible problems will lower societal burden.[3]

Today, quality of life (QOL) as well as survival have become important outcome measures in BC clinical trials and survival studies, as diagnosis and treatment of the disease have improved greatly over time.[4,5] Frequently, BC diagnosis and treatment are accompanied by alterations in physical function and condition, unpleasant side effects, a loss in QOL and impaired social connections.[6] BC patients and survivors are always negatively affected by extended psychological status. According to clinical studies, the prevalence of mental illnesses in BC patients and survivors is substantially higher than in the general population.[7-9] Anxiety and depression are the two most prevalent psychological symptoms. The prevalence of depression and anxiety among BC patients was up to 32.2% and 41.9%, respectively, according to prior meta-analyses.[7,9] For this reason, factors, such as anxiety, depression and physical inactivity, which have significant effects on QOL, should be investigated during BC treatment (early period, 1 year) and after BC treatment (long period, >1 years), as well as compared with the general population.[10,11] In this way, it can guide health professionals as to which problems they should prioritise based on the time of the disease.

Physical activity is connected with improved BC outcomes in terms of physical and psychological functions, such as fewer BC recurrences, lower risk of premature mortality, and new BC primary tumors.[12] Despite the growing evidence of the importance of exercise after cancer, it is reported that approximately 55% of women with BC do not

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achieve nationally recommended levels of physical activity, and that approximately 60% of patients experience a decrease in physical activity levels following cancer diagnosis.[12,13] Against this background, recent guidelines recommend increasing the level of physical activity and maintaining lifelong exercise behaviour in BC patients.[13] To this end, identifying patients' barriers to exercise can guide healthcare workers in creating physical activity and exercise programmes that are likely to increase participation in physical activity and exercise.[14,15] Studies on the subject have reported various individual, environmental and psychological barriers to exercise in BC patients.[14,16] However, there remains a lack of evidence on barriers to regular physical activity in BC patients and BC survivors.[12,13,16,17]

Lack of knowledge about the types of activities permitted during and after cancer, bad mood, depression, anxiety, apathy and kinesiophobia are among the barriers to physical activity. Kinesiophobia is the fear and anxiety of movement and activity due to a perception of vulnerability or damage susceptibility. High levels of kinesiophobia are associated with low levels of physical activity.[18] Due to kinesiophobia, the individual may choose to avoid or limit physical activity levels rather than gradually increasing them. Kinesiophobia has been highlighted as a barrier to exercise for patients with musculoskeletal disorders[19] but its prevalence in BC patients and survivors has received less attention despite its importance.[17,18,20]

The current study was planned to investigate kinesiophobia, physical activity levels and barriers to physical activity in BC patients and survivors, and compare it with healthy controls.

Subjects and Methods

The case-control study was conducted at the Breast Clinic of Acıbadem Maslak Hospital, and the Department of Physiotherapy and Rehabilitation at Acibadem Mehmet Ali Aydinlar University, Turkey, from October 2021 to July 2022, and comprised patients with breast cancer in group A, breast cancer survivors in group B and healthy controls in group C.

After approval from the institutional ethics review committee, the sample size was calculated using G*Power 3.1[21] based on 0.05 margin of error, 95% power and 95% confidence interval (CI), while keeping BC prevalence at 25%.[22] The sample size was inflated by about 25% taking into account potential losses.

Consecutive sampling technique was used to raise groups A and B. Those included in group A were female patients aged 30-75 years with Grade I-III BC whose surgery was completed at least three months ago and who had not passed 1 year post-surgery. Those included in group B were female BC survivors who had not received any adjuvant therapy other than hormone therapy and whose primary treatment (surgery, radiotherapy and/or chemotherapy) was completed one years ago. Random sampling technique was used to raise group C by conducting face-to-face interviews with women who responded to a social media announcement or advertisement posted at bus-stops around the university and filled out the university's online voluntary consent form. In the announcement/advertisement, women aged >35 years without any medical conditions were specified. In order to prevent bias, the announcement/advertisement stated that the participants should not be healthcare workers, university employees or students, but no difference in educational status was stated. During the face-to-face interview, women from a similar neighbourhood were selected from the list of applicants.

For all the 3 study groups, individuals were excluded if they had problem in reading and writing in Turkish, poor cognitive functions, severe chronic, musculoskeletal, psychiatric disease, and ongoing exacerbation of cancer or metastasis.[18]

Data was collected after taking written informed consent from all the participants. Evaluation of primary outcomes measures was done for physical activity levels, barriers to physical activity and kinesiophobia levels. Secondary outcome assessments included anxiety and depression levels and QOL. The data was collected using standard tools, including International Physical Activity Questionnaire-Short Form (IPAQ-SF), Tampa Scale of Kinesiophobia (TSK), Hospital Anxiety and Depression Scale (HADS), Fatigue Severity Scale (FSS) and 30-item European Organisation for Research and Treatment of Cancer core quality of life questionnaire (EORTC QLQ-C30).

The IPAQ-SF questionnaire explores the preceding 7 days, and also measures sitting time in minutes. Activities are measured based on the duration and intensity of activities and the metabolic equivalent of task (MET).[23]

Barriers to physical activity were evaluated based on a questionnaire used in an earlier study.[12] It assessed a total of 35 barriers and classified them into four categories; symptom-related (n=10), individual (n=10), psychosocial (n=8) and environmental (n=7) factors.[24]

Participants' perceptions of physical activity were measured using the question: how important exercise is for daily life and health. The answer was on a Likert scale, ranging from not important at all to very important.[12]

The TSK is a 17-item scale was used to measure fear of physical activity and was scored on a 4-point Likert scale, ranging from 1=strongly disagree to 4=strongly agree. The scale yielded a score ranging 17-68 points, and a cut-off score of 37 points and above indicated kinesiophobia.[19]

The HADS is a 14-item scale scored on four-point Likert scale to measure anxiety and depression levels. Patients can receive a minimum score of 0 and a maximum score of 21 from both subscales. The score is categorised as 0-7=normal, 8-10=borderline and 11-21=abnormal.[25]

The FSF consisted of 9 items. Each item was scored 1-7, with lower total scores denoting less fatigue.[26]

The EORTC QLQ-C30 assessed the QOL of cancer patients. Healthful functioning was characterised by high functional scale scores. Likewise, a high global health status score indicated a higher QOL. On the other hand, symptom scales with high scores indicated a high level of problems. All scales were converted to a score ranging 0-10027.

Data was analysed using SPSS 22. Data was expressed as mean±standard deviation or as frequencies and percentages. Data normality was checked using the Shapiro-Wilk test. Data was examined and accepted as being sufficiently normal if the skewness and kurtosis were within the range from −2 to +2. All data showed normal distribution. Categorical data was analysed using chi-squared test. In numerical data, differences among the three groups were evaluated using one-way analysis of variance (ANAVO) and Tukey's test. Statistical significance was set at $p \leq 0.05$ for all tests.

Results

Initially, there were 240 subjects enrolled in the study. There were 75(31.2%) women each in groups A and B. In group A, 2(2.7%) patients were excluded owing to severe anxiety, 2(2.7%) because of rheumatic disease, and 1(1.3%) patient had Grade III gonarthrosis. Likewise, in group B, 2(2.7%) patients were excluded due to episodes of low back pain, 2(2.7%) because of severe anxiety, and 1(1.3%) patient had Parkinson's disease. There were 90(37.5%) women in group C. Of them, 5(5.5%) returned incomplete questionnaire, 4(4.4%) were excluded because of rheumatic disease, and 3(3.3%) each were excluded owing to severe psychiatric disease, Grade III gonarthrosis, and severe musculoskeletal disease. As such, the study was

Table-1: Demographic and clinical characteristics of the participants.

Characteristic	HC (n=72) Group C	BC (n=70) Group A Mean±SD or n (%)	BC-S (n=70) Group B	Comparison among groups F-values		Post hoc pairwise comparison HC versus BC (Group C versus Group A)	HC versus BC-S (Group C versus Group B)	BC versus BC-S (Group A versus Group B)
					p^a	p^b	p^b	p^b
Age (years)	47.03±7.48	50.71±11.30	47.64±9.85	2.934	0.055	0.063	0.924	0.147
Body mass index (kg/m^2)	26.57±4.70	25.82±4.20	25.47±4.95	1.011	0.366	0.619	0.346	0.894
Duration of disease (months)	-	08.76±02.06	45.89±31.23	65.074	**<0.001**	N.D	N.D	**<0.001**
Marital status								
Single	14 (19.40)	8 (11.40)	15 (21.40)	N.D	0.255[c]	0.187[c]	0.769[c]	0.235[c]
Married	58 (80.60)	62 (88.60)	55 (78.60)					
Number of children	2.24±1.01	1.61±1.01	1.24±1.24	12.903	**<0.001**	**0.050**	**<0.001**	**0.016**
Menopause status								
Yes	22 (30.60)	33 (47.10)	21 (30.00)	N.D	**<0.001**[c]	**<0.001**[c]	**0.014**[c]	**0.005**[c]
No	49 (68.10)	20 (28.60)	39 (55.70)					
Menopause Due to Treatment	1 (01.40)	17 (24.30)	10 (14.30)					
Educational Status (years)	11.86±3.32	12.35±3.53	14.11±2.65	**9.711**	**<0.001**	0.625	**<0.001**	**0.004**
Employment status								
Working	24 (33.80)	32 (45.70)	23 (32.90)	N.D	**<0.001**[c]	**<0.001**[c]	**<0.001**[c]	0.295[c]
Retired	5 (7.00)	23 (32.90)	28 (40.00)					
Housewife	42 (59.20)	15 (32.90)	19 (27.10)					
Surgery								
Breast Conserving Surgery	-	13 (18.60)	28 (40.00)	N.D	**0.020**[c]	N.D	N.D	**0.020**[c]
Modified radical mastectomy	-	29 (41.40)	22 (31.40)					
Radical mastectomy:	-	28 (40.00)	20 (28.60)					
Post-Surgical Therapy								
Chemotherapy	-	63 (90.00)	62 (88.57)	N.D	0.785[c]	N.D	N.D	0.785[c]
Radiotherapy	-	40 (57.10)	44 (62.90)	N.D	0.490[c]	N.D	N.D	0.490[c]
Hormone Therapy	-	52 (74.28)	50 (71.43)	N.D	0.454[c]	N.D	N.D	0.454[c]

Group C and HC: Healthy controls, Group A and BC: Breast cancer patients, Group B and BC-S: Breast cancer survivors, ND: Non-determined, n: Number of participants;
[a]One-way analysis of variance (ANOVA), [b]post-hoc Tukey's test, [c]Chi-squared test. Bold values indicating statistical significance between groups.

Table-2: Inter-group comparison of study variables.

Assessment	HC (n=72) Group C	BC (n=70) Group A	BC-S (n=70) Group B	Comparison among groups		Post hoc pairwise comparison		
				F-values	*p**	HC versus BC (Group C versus Group A) *p*†	HC versus BC-S (Group C versus Group B) *p*†	BC versus BC-S (Group A versus Group B) *p*†
	Mean±SD or n (%)							
Visual Analog Scala (Overall Body Pain, 0-10 point)								
Resting	1.25±1.72	1.71±2.55	1.24±2.06	1.130	0.325	0.398	0.998	0.392
At Night	1.09±1.36	2.11±2.64	1.76±2.52	3.756	**0.025**	**0.021**	0.189	0.615
During Activity	1.29±1.53	2.26±2.75	2.14±2.15	3.536	**0.031**	**0.042**	0.084	0.956
IPAQ-Short Form								
MET Total	2197.59±2329.81	652.48±657.48	1123.66 ± 1169.85	17.03	**<0.001**	**<0.001**	**<0.001**	0.177
Sitting (min)	218.58±105.94	224.73±84.53	229.61±108.20	0.19	0.828	0.929	0.786	0.955
Inactive (<600 MET-min/week)	22 (30.56)	42 (60.00)	33 (47.14)	N.D	**<0.001‡**	**<0.001‡**	**0.005‡**	0.174‡
Minimally Active (600-3000 MET-min/week)	29 (40.28)	27 (38.57)	31 (44.29)					
Sufficiently Active (>3000 MET-min/week)	21 (29.17)	1 (01.43)	6 (08.57)					
Tampa Scale of Kinesiophobia	38.44±6.28	38.62±5.68	36.44±6.70	2.48	0.088	0.983	0.138	0.098
Number of Subjects with Kinesiophobia (Scores≥37 points)	46 (63.88)	40 (57.14)	30 (42.85)	N.D	**0.037**	0.493	**0.018**	0.146
Fatigue Severity Scale Score	02.95 ± 1.58	03.74±1.52	03.15±1.76	4.91	**0.009**	**0.012**	0.796	0.081
Hospital Anxiety and Depression Scale (HAD)								
HAD- Anxiety Score	6.57±3.83	7.29±4.03	6.51±4.04	0.74	0.481	0.546	0.996	0.501
Normal Score (0-7 points)	49 (68.05)	40 (57.14%)	45 (64.28)	N.D	0.534‡	0.349‡	0.452‡	0.760‡
Borderline Anxiety (8-10 points)	9 (12.50)	14 (20.00)	14 (20.00)					
Abnormal Score (11-21 points)	14 (19.44)	16 (22.86)	11 (15.71)					
HAD- Depression Score	5.61±4.04	5.74±4.03	5.74±4.03	0.15	0.857	0.978	0.938	0.853
Normal Score (0-7 points)	53 (73.61)	50 (71.43)	49 (70.00)	N.D	0.834‡	0.856‡	0.749‡	0.174‡
Borderline Anxiety (8-10 points)	10 (13.89)	9 (12.85)	13 (18.57)					
Abnormal Score (11-21 points)	9 (12.50)	11 (15.71)	8 (11.43)					

Group C and HC: Healthy controls, Group A and BC: Breast cancer patients, Group B and BC-S: Breast cancer survivors, ND: Non-determined, n: Number of participants, IPAQ: International Physical Activity Questionnaire, MET: Metabolic equivalent of task; * One-way analysis of variance (ANOVA), † post-hoc Tukey's test, ‡ Chi-squared test. Bold values indicating statistical significance between groups.

completed by 212(88.3%) women. Of them 70(33%) were in group A with mean age 50.71±11.30 years, 70(33%) in group B with mean age 47.64±9.85 years, and 72(34%) in group C with mean age 47.03±7.48 years. There was no significant difference among the groups with respect to age, education level and employment status (Table 1).

Group A had higher scores for overall body pain at night and during physical activity compared to group C ($p<0.05$). In terms of physical activity levels, group C was more active than the other groups ($p<0.001$), but had greater fear of movement than group B ($p<0.05$) (Table 2).

Group C had better QOL than group A ($p=0.044$). Social functioning, insomnia and financial difficulties were significantly worse in group B compared to group C ($p<0.05$). The fatigue score of group A was significantly higher than of group B ($p=0.030$) (Table 3).

In barriers to physical activity, group C experienced certain symptom-related problems that were fewer than the other groups and ($p<0.05$). Group A reported experiencing symptoms of poor balance and nausea more frequently than the other groups ($p<0.05$). Group C had more barriers to physical activity related to certain individual factors, like having other responsibilities, not having time, working, and not liking sweating, compared to the other groups ($p<0.05$).

In psychosocial barriers to exercise, group C more frequently reported avoiding exercise for fear of getting tired compared to the other groups ($p=0.009$). Groups B and C found exercise more boring than group A ($p= 0.004$), while group A was more afraid of falling ($p=0.005$) and agreed with the statement, "I might feel worse if I exercise", more than the other groups ($p=0.034$). Group B was also more afraid of exacerbation of lymphoedema ($p<0.001$). In environmental barriers to exercise, a greater proportion of participants in group C compared to the other groups agreed with the statements, "I do not have suitable clothes, shoes and equipment to exercise" (p=0.019), and, "I am not informed about any appropriate exercise programme" ($p=0.002$) (Table 4).

Discussion

Although the current study found that healthy controls in

Table-3: Inter-group comparison of participants' quality of life.

Assessment (Quality of Life -EORTC QLQ –C 30)	HC (n=72) Group C	BC (n=70) Group A	BC-S (n=70) Group B	Comparison among groups F-values	*p**	Post hoc pairwise comparison HC versus BC BC(Group C versus Group A) *p*†	HC versus BC-S (Group C versus Group B) *p*†	BC versus BC-S (Group A versus Group B) *p*†
		Mean±SD						
Functional Difficulties								
Physical functioning	81.41±12.90	73.05±20.32	76.86±18.33	3.87	**0.022**	**0.016**	0.286	0.405
Role functioning	84.10±20.13	80.71±26.87	81.67±26.49	0.33	0.717	0.707	0.836	0.972
Emotional functioning	80.05±21.38	67.74±26.96	72.02±23.27	4.57	**0.011**	**0.009**	0.128	0.543
Cognitive functioning	83.84±19.39	78.33±26.82	79.76±21.02	1.07	0.345	0.336	0.548	0.926
Social functioning	95.96±12.42	75.00±28.62	78.81±25.05	15.52	**<0.001**	**<0.001**	**<0.001**	0.597
Symptom Control								
Fatigue	36.20±22.76	47.46±24.51	36.51±28.32	4.44	**0.013**	**0.028**	0.997	**0.030**
Nausea and vomiting	3.03±8.73	11.67±21.68	7.62±15.46	4.78	**0.009**	**0.006**	0.230	0.307
Pain	21.46±20.21	32.14±26.82	24.29±25.33	3.54	**0.031**	**0.030**	0.778	0.139
Dyspnoea	4.55±12.92	12.86±22.91	10.95±22.50	3.16	**0.044**	**0.044**	0.154	0.841
Insomnia	19.70±26.78	38.10±36.02	33.81±36.11	5.61	**0.004**	**0.004**	**0.039**	0.728
Appetite loss	7.58±15.24	14.76±24.50	11.43±24.00	1.85	0.160	0.135	0.558	0.637
Constipation	12.63±25.99	20.95±29.58	14.76±23.83	1.82	0.165	0.164	0.886	0.355
Diarrhoea	2.53±10.64	6.67±16.64	6.67±16.64	1.71	0.183	0.243	0.243	1.000
Financial difficulties	4.55±16.42	15.71±21.02	17.62±23.89	7.80	**0.001**	0.006	**0.001**	0.850
Overall Health Status	69.44±25.08	67.98±20.15	67.98±22.99	0.09	0.911	0.925	0.925	1.000

EORTC-QLQ-C30: 30-item European Organisation for Research and Treatment of Cancer core quality of life questionnaire, **Group C and HC:** Healthy controls, **Group A and BC:** Breast cancer patients, **Group B and BC-S:** Breast cancer survivors, ND: Non-determined; * One-way analysis of variance (Anova), † post-hoc Tukey's test. Bold values indicating statistical significance among groups.

group C achieved more positive results in physical activity levels, fatigue and QOL scores than the other groups, they had more negative perceptions of physical activity and reported having more barriers to physical activity than the other groups. Group C was also found to have a greater fear of movement than BC survivors in group B. BC patients in group A had more symptom-related barriers, with higher levels of overall body pain during night-time and activity, fatigue, poor balance, fear of falling, and fear of feeling worse after exercise compared to the other groups. Subjects in group B were more afraid that their lymphoedema might worsen if they exercised.

Participation in adequate physical activity is crucial for both cancer patients and cancer survivors. However, studies from Canada,[24] the United States[28] and Germany[29] found that only 15% to 30% of cancer patients had sufficient participation in physical activity. The present study also found group C was more active than the other groups. Furthermore, only 1% of the subjects in group A and 8% of the subjects in group B were sufficiently active. Interestingly, the rates found in the study were much lower compared to other countries.[24,28-31] This can be attributed to the fact that the prevalence of sufficient physical activity even among healthy women is lower in Turkey[32,33] compared to other countries.[30,31] It may also be because the present study was conducted at a time when the coronavirus disease-2019 (COVID-19) pandemic was going on with all its consequences. Lower levels of physical activity in group C in Turkey compared to other countries[30,31] may also be explained by other reasons, including having less positive perceptions of physical activity, high rates of kinesiophobia, more individual and environmental barriers to exercise, like having other responsibilities, lack of time, work, unfavourable weather conditions, not liking sweating, not having appropriate clothes, shoes and equipment to exercise, and lack of information about appropriate exercise programmes, compared to the other two groups. In a study conducted on healthy adults in Turkey during the COVID-19 period, it was shown that although individuals did not have the disease, kinesiophobia rates increased in individuals as walking, physical activities and education level decreased, and the rate of kinesiophobia was as high as 54.8%.[32] Greater numbers of individual barriers may be due to the patriarchal social structure in Turkey, which means that most of the child care and domestic work are done by women,[12] Future studies should further focus on kinesiophobia, and individual and environmental barriers among the healthy female population in Turkey, and that various educational activities and motivational interviews should be conducted not only with patients, but also with the healthy population.

Given the health benefits of physical activity in improving health outcomes and survival in cancer patients, it is important to make exercise education and rehabilitation an integral part of cancer care services. However,

Table-4: Subjects' perceptions of and barriers to physical activity.

Assessment	HC (n=72) Group C n (%)	BC (n=70) Group A n (%)	BC-S (n=70) Group B n (%)	Comparison among groups *p*-value
How important is exercise to you in your life?				
Not important at all	6 (08.30)	6 (08.60)	4 (5.70)	**0.001**
Somewhat important	25 (34.70)	14 (20.00)	10 (14.30)	
Moderately important	29 (40.30)	19 (27.10)	27 (38.60)	
Very important	12 (16.70)	31 (44.30)	29 (41.40)	
How important is exercise to your health?				
Not important at all	1 (01.40)	0 (00.00)	0 (00.00)	**<0.001**
Somewhat important	9 (12.50)	1 (01.40)	0 (00.00)	
Moderately important	18 (25.00)	11 (15.70)	15 (21.40)	
Very important	44 (61.10)	58 (82.90)	55 (78.60)	
Barriers to Exercise				
Symptom-Related Barriers				
Fatigue	48 (66.66)	50 (71.42)	39 (55.71)	0.143
Pain	25 (34.72)	47 (67.14)	45 (64.28)	**0.010**
Lymphoedema	0 (0.00)	10 (14.29)	23 (32.85)	**<0.001**
Common Cold	5 (06.94)	11 (15.71)	17 (24.28)	**0.035**
Heart and Lung Condition	2 (02.78)	8 (11.43)	6 (08.57)	0.084
Headache	9 (12.50)	17 (24.28)	15 (21.43)	0.156
Nausea	6 (08.30)	14 (20.00)	5 (7.14)	**0.050**
Weight Gain or Loss Problems	9 (12.50)	11 (15.71)	14 (20.00)	0.350
Gastrointestinal Problems (Stomach and Intestinal Problems)	12 (16.70)	14 (20.00)	7 (10.00)	0.523
Poor Balance	12 (16.70)	22 (31.43)	11 (15.71)	**0.031**
Individual Barriers				
I have other responsibilities	49 (68.05)	25 (35.71)	24 (34.28)	**<0.001**
Not a priority	31 (43.05)	18 (25.71)	19 (27.14)	0.072
I'm busy	24 (33.33)	12 (17.14)	18 (25.71)	0.124
I do not have time	38 (52.78)	8 (11.43)	18 (25.71)	**<0.001**
I don't feel like	17 (23.61)	13 (18.57)	16 (22.86)	0.583
I can't force myself to do it	37 (51.39)	31 (44.29)	38 (54.28)	0.442
I do not know how to do it	12 (16.67)	14 (20.00)	11 (15.71)	0.844
I am working	24 (33.33)	9 (12.85)	18 (25.71)	**0.022**
Not important for me	7 (09.72)	4 (05.71)	8 (11.43)	0.526
I don't like sweating	20 (27.78)	2 (02.86)	6 (08.57)	**<0.001**
Psychosocial barriers				
I feel bad	12 (16.67)	14 (20.00)	6 (08.57)	0.231
If I exercise, I will get tired	22 (30.56)	17 (24.27)	6 (08.57)	**0.009**
I don't enjoy exercise as much as I used to	20 (27.78)	13 (18.57)	15 (21.43)	0.428
My lymphedema can flare	0 (0.00)	5 (07.14)	13 (18.57)	**<0.001**
Exercise is so boring	14 (19.44)	2 (02.86)	13 (18.57)	**0.004**
I am afraid of falling	3 (04.17)	14 (20.00)	5 (07.14)	**0.005**
I think exercise is harmful	1 (01.17)	0 (00.00)	0 (00.00)	0.377
I may feel worse if I exercise	2 (02.78)	9 (12.86)	2 (02.86)	**0.034**
Environmental Barriers				
Unfavourable weather conditions	14 (19.44)	41 (58.57)	30 (42.86)	**<0.001**
There is no one to help me during the exercise	11 (15.28)	12 (17.14)	11 (15.71)	0.942
Having no one to exercise with	19 (26.39)	12 (17.14)	17 (24.29)	0.388
I don't have an environment for proper exercise	18 (25.00)	10 (14.29)	7 (10.00)	0.123
I don't have appropriate clothing, shoes and equipment to exercise.	4 (05.55)	2 (02.86)	2 (02.86)	**0.019**
I am not informed about an appropriate exercise programme	20 (27.78)	7 (10.00)	4 (05.71)	**0.002**
I have an inappropriate exercise programme	7 (09.72)	4 (05.71)	8 (11.43)	0.526

Group C and HC: Healthy controls, G**roup A and BC**: Breast cancer patients, **Group B and BC-S**: Breast cancer survivors; Bold values indicating statistical significance among groups.

healthcare providers in Europe and the US reported that time constraints in clinics limit their ability to support and guide participation in physical activity.[33] Thus, designing individualised physical activity programmes to facilitate participation in physical activity and encouraging behavioural change by taking account of perceptions of physical activity and barriers to exercise can better guide health professionals in making effective use of their time.[34]

Interestingly, in the current study, when asked "How important is an exercise to your life?", fewer participants in group C compared to groups A and B stated it was "important". Patients in the current study were found to have more positive perceptions of exercise. This result was in line with a study conducted earlier in Turkey.[12] Nevertheless, although groups A and B had better perceptions of the importance of exercise compared to the control group, they had lower levels of participation in physical activity. This may be taken to mean that BC patients and BC survivors had fewer but more severe barriers to exercise. Indeed, analysis of barriers to exercise showed that group A had more symptom-related barriers, such as poor balance and nausea, as well as higher levels of fatigue, overall

body pain, poor balance, fear of falling, and fear of feeling worse after exercise compared to groups B and C. However, despite these negative barriers, groups A and B were similar to the control group in terms of the number of subjects with kinesiophobia. Although psychosocial factors are known to play an important role in pain-related disability, and kinesiophobia is reported to make the greatest contribution to the score in the pain disability index[18] the current study achieved an interesting result in that fear of movement in group A, measured with the TSK, was not different than that of group C. This may be because the healthy control group consisted of people with high levels of kinesiophobia (46% in group C vs 57.14% in group A). Indeed, 31% of the subjects group B reported having poor balance, 20% were afraid of falling, and 12.86% were afraid of feeling worse if they exercised. These results were in line with previous studies.[35,36] Group B had a fear of movement/kinesiophobia and this might have led to their insufficient participation in physical activity. The present study also found that more than half of the subjects in group A had barriers to exercise including fatigue, pain and unfavourable weather conditions. It has already been reported that patients with high rates of fatigue tend to avoid physical activity.[37]

The high prevalence of kinesiophobia (46% in group C 57.14% in group A, and 42.85% in group B) among the participants necessitated the addition of this variable in treatment protocols. However, there is very little research on this topic. In a study,[38] training cancer survivors along with aerobic and strengthening exercises led to a reduction in the fear of movement, particularly in patients with a high fear of movement. However, this result was not observed in those with a moderate fear of movement. In order to reduce kinesiophobia, psychosocial treatment should be added to education and rehabilitation interventions in meta-analyses of musculoskeletal disorders. It has been demonstrated that a multimodal treatment administered in this manner can alleviate movement kinesiophobia.[19] Future studies investigating multimodal treatments for the treatment of kinesiophobia in cancer patients and survivors are, therefore, necessary.

Previous studies have reported that cancer survivors have a number of treatment-related, individual, environmental and psychological factors that act as barriers to exercise.[12,13,17-19] The present study also found some of these barriers in the study population. This means particular attention must be paid to psychosocial barriers in BC patients and survivors. Each patient should be evaluated individually in this regards and treatment strategies increasing physical activity based on the type of barrier present should be explored. A review[33] reported that individual evaluations and activities should be recommended to increase cancer patients' physical activity participation during and after treatment, and that patients should be continuously informed with feedback, and individual interventions should be continued. Future research is needed to develop strategies for the various barriers to exercise in cancer patients.

The present study had some limitations. First, the cross-sectional design prevented the emergence of temporal relationships, and most outcome measures were self-reported. Second, the study was conducted at a time when the COVID-19 pandemic was still going on. However, the fact that most of the findings were in line with previous studies may indicate that the pandemic did not significantly limit the current study. Third, the investigated parameters were those that can significantly influence one another. For instance, fatigue and anxiety/depression are typically highly correlated, can potentially interfere with one another, and can lead to uncertain results. The analyses were not adjusted for confounding factors. Fourth, there was a difference in education levels between the groups and most of the women in group C were housewives. This may have created a difference among the groups in terms of perception and awareness.

Despite the limitations, the findings suggested that barriers to participation in physical activity and kinesiophobia in BC patients and survivors should be addressed particularly carefully to facilitate participation in physical activity.

Conclusions

BC patients were found to have more symptom-related disabilities to physical activity compared to the other groups. BC survivors were more afraid that their lymphoedema might get worse if they exercised. The level of kinesiophobia was found to be high in all the groups.

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NA: Concept, data interpretation, analysis, preparation, revision and supervision.
KTK: Concept, data interpretation, analysis, revision and supervision.
DCA, MBK: Data interpretation, analysis, preparation, revision and supervision.
CU: Concept, revision and supervision.