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Research Article

Investigation of the Relationship Between Kinesiophobia and Pain, Quality of Life and Physical Functions in Osteoarthritis Patients

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Abstract

Aim: Osteoarthritis (OA) is a chronic, degenerative joint disease that is characterised by joint pain and stiffness. The development of kinesiophobia is common in OA patients, especially related to pain and loss of function. The aim of our study was to determine the relationship between kinesiophobia and pain, quality of life and physical functions in patients with knee OA.
Material and Method: A total of 60 patients (30 females and 30 males, aged 40-65 years) diagnosed with Kellgren-Lawrence (KL) grade 2 and 3 OA participated in this cross-sectional study. Tampa Scale for Kinesiophobia (TSK), Short Form Health Survey (SF-12), Visual Analogue Scale (VAS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Oxford Knee Score (OKS), Lower Extremity Functional Scale (LEFS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Berg Balance Scale (BBS) scales and Timed Up and Go (TUG), 6-Minute Walking Test (6MWT), The Five Repetition Sit to Stand Test (5STS) and Stair-Climbing Test (SCT) functional tests were performed.
Results: A statistically significant difference was observed between the male and female groups in all scales and functional test results, with the exception of TSK ($p<0.05$). A positive correlation was found between kinesiophobia and SCT in the female group, while a negative correlation was found between TUG and SF-12 PCS in the male group ($p<0.05$).
Conclusion: The findings indicated that, in general, kinesiophobia was not significantly correlated with pain, knee score, balance, quality of life and functional tests in male and female OA patients. However, some scales and tests showed positive and negative correlations with kinesiophobia in both groups, although limited.

Keywords: Osteoarthritis, kinesiophobia, pain, quality of life, physical function

INTRODUCTION

Osteoarthritis (OA) is a degenerative joint disease that is characterised by the deterioration of cartilage in joints, as well as the formation of new bone and sclerosis (1,2). Radiologically, it can be examined in five different grades according to the Kellgren-Lawrence (KL) classification, which indicates that radiologic findings progressively worsen from zero to grade four (3,4). It is estimated that approximately 250 million people worldwide are affected by OA, a degenerative joint disease (5). In the treatment of OA, pharmacologic methods are usually limited to the use of paracetamol or non-steroidal anti-inflammatory drugs (6). In addition to drug treatment, there are various conservative treatment options including patient education, weight control, activity modification, exercise therapy, appropriate footwear selection, supportive devices and various physical therapy methods (7-9).

OA is characterized by pain and stiffness in the joints and this may lead to loss of function in daily life activities (10). It has been observed that joint movements, especially flexion and rotation, increase the level of pain in OA patients (11). Increased pain during these movements may lead to a tendency to avoid movements and even fear of movement (12). In conditions such as chronic musculoskeletal pain, individuals generally tend to avoid activities due to fear of pain rather than actual pain (13). This may lead to a

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decrease in the ability to perform basic tasks in daily life such as sitting, walking, standing and climbing stairs (14). Lack of regular physical activity in OA patients is considered an important risk factor for functional decline (15). Conversely, elevated levels of physical activity are frequently linked to enhanced knee strength and improvements physical performance (16). Nevertheless, despite the established advantages of physical activity, a considerable number of individuals with knee OA continue to engage in minimal or no physical activity (17). Previous studies has identified several factors that influence participation in physical activity in OA patients. These factors include older age, non-white ethnicity, increasing OA symptoms and female gender (18). Moreover, psychological factors, such as anxiety and depression, are believed to be more prevalent in women with knee OA and are thought to be a significant contributing factor to the persistence of pain (19). Avoidance of activities and weight bearing on the knee joint for long periods of time due to fear of painful injury or re-injury, known as kinesiophobia, which is common in OA patients, may decrease knee muscle strength and endurance (8,20). It can be reasonably deduced that the presence of kinesiophobia may serve to exacerbate functional performance deficits in patients with OA and diminish quality of life by interfering with activities of daily living (21,22). A review of the literature reveals a correlation between kinesiophobia and several key factors in musculoskeletal disorders, including high pain intensity, poor functional status, and high psychological and physical disability (23,24). Furthermore, high levels of kinesiophobia in OA patients, especially in the elderly, can be associated with increased pain levels and decreased functional performance (25).

OA is a very important and influential factor for the patient in terms of both health and socioeconomic costs. For this reason, it is thought that determining the relationships between factors such as functional status, pain, quality of life and kinesiophobia in OA may contribute to the OA treatment process. The aim of our study was to investigate the relationship between kinesiophobia, pain, quality of life, and physical functions in patients with knee osteoarthritis. The main hypothesis of this study is that kinesiophobia may have positive correlations with pain parameters and negative correlations with knee scores, quality of life scales and functional performance in OA patients.

MATERIAL AND METHOD

Participants

A total of 60 patients, 30 females and 30 males, aged 40-65 years, diagnosed with KL grade 2 and 3 OA, who completed filled out informed consent forms were included in this study. The G*Power 3.1 software was employed to ascertain the requisite number of subjects for inclusion in the study. The results indicated that a total of 22 subjects in each group would be an appropriate sample size (effect size r: 0.85, lower and upper critical p: 0.55, true power: 0.93). Inclusion criteria for participants: (i) over 25 years of age, (ii) knee pain for more than three months, (iii) radiologic presence of bilateral OA changes in the tibiofemoral joint. Exclusion criteria for participants: (i) a history of injury or surgical intervention affecting the lower extremities, (ii) history of the development of systemic inflammatory arthritis, (iii) infiltration corticosteroids in the knees in the last six months, and (iv) history of meniscus or ligament injury in the knee.

Experimental Design

This observational study was a cross-sectional design. All measurements were completed on two consecutive days and during the same time period (13.00-15.00). On the first day, participants completed the Tampa Scale for Kinesiophobia (TSK), Visual Analogue Scale (VAS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Lower Extremity Functional Scale (LEFS), Oxford Knee Score (OKS), Short Form Health Survey (SF-12), Western Ontario and McMaster Universities v Index (WOMAC) and Berg Balance Scale (BBS). In addition, the 6-Minute Walking Test (6MWT) and The Five Repetition Sit to Stand Test (5STS) were performed on the same day. On the second day, Timed Up and Go (TUG) and Stair-Climbing Test (SCT) tests were performed (Figure 1). The primary endpoint of the study was the successful completion of the tests and the secondary endpoint was the patient's unwillingness to continue the study for various reasons and the occurrence of any trauma to the index joint.

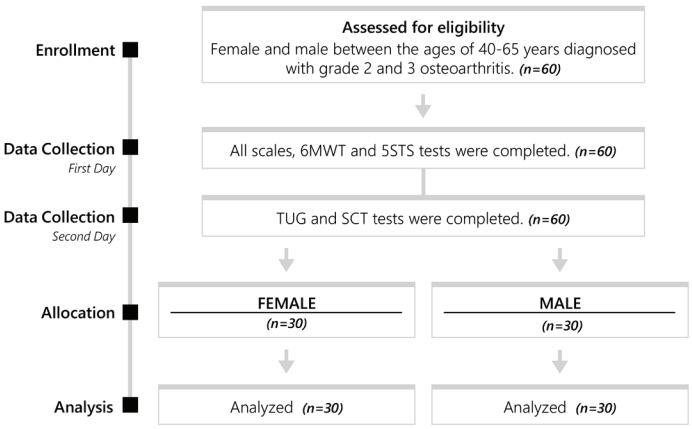

Figure 1. Flowchart

This study was conducted in accordance with the ethical guidelines stated in the Declaration of Helsinki and ICH Good Clinical Practice guidelines. Approval from the ethics committee of Gümüşhane University Scientific Research and Publication Ethics Committee was obtained (protocol no: E-95674917-108.99-222915).

Outcome Measures

Pain and Quality of Life Scales

VAS: This scale is used to assess knee pain and is self-assessed by patients. Patients mark a point on a 10 cm long line between "no pain" and "worst possible pain" according to their level of pain. Higher scores indicate more pain.

TSK: TSK is a scale that assesses fear of injury. It consists of 17 questions and is rated on a scale from 1 to 4. The total score ranges from 17 to 68, with higher scores indicating

an increased severity of pain-related fear. A score of 17 represents no kinesiophobia and a score of 68 represents severe kinesiophobia.

KOOS-PS: KOOS-PS is a seven-item scale used to assess the difficulties people experience in daily activities related to knee health. All items are evaluated on a five-point Likert scale, with scores ranging from 0 to 4 (none, mild, moderate, severe, extreme). The scale is scored from 0 (no problems) to 100 (extreme problems), assessing how smoothly people are able to perform these activities.

OKS: OKS assesses the patient's pain and functional status in the last 4 weeks and consists of 12 questions. It is assessed on a scale of 0 to 48, with lower scores indicating better pain and functional status.

SF-12: SF-12 is a shortened version of the SF-36 and is used to assess health-related quality of life. The scale consists of 12 items and physical and mental component summary scores (PCS and MCS) are calculated and evaluated with a specific scoring algorithm. The scores are expressed on a scale of 0 to 100, with higher scores indicating a superior quality of life.

LEFS: LEFS is a scale that assesses lower limb function and activity limitation. The questionnaire consists of 20 items in total and each item is scored from 0 to 4 on a scale from "extremely difficult" to "no difficulty". The highest total score is 80, with higher scores indicating a higher functional level.

WOMAC: The scale comprises 24 items and was developed for the purpose of assessing pain, joint stiffness and physical function in individuals with knee and hip OA. Higher scores indicate more severe pain, stiffness and functional limitations.

Functional Performance Tests

TUG: For TUG, a tape was placed on the floor 3 meters in front of a standard height chair. Patients were seated on the chair, asked to rest their backs on the chair backrest and arms on the armrests. They were instructed to walk 3 meters at a normal speed, turn around, return to the chair and sit down, and the elapsed time was recorded in seconds.

6MWT: 6MWT was conducted indoors in a long and straight corridor. The walking track was 30 meters long with markings every 2.5 meters. Before the test, patients rested seated for 10 minutes and then were asked to walk the course for 6 minutes. They could pause and rest if needed and were allowed to use assistive devices such as canes if necessary. The distance covered during walking was recorded in centimeters.

5STS: The 5STS involves patients getting up and sitting down from a chair five times as quickly as possible with their arms crossed at chest level. The timing started as soon as the patients lifted their hips off the chair and stopped on their fifth sit-up. The test was repeated twice for each patient and the best result was used for analysis. The elapsed time was measured with a stopwatch.

SCT: The staircase required for the test consisted of 6 steps, each step being 17,5 cm high. Patients completed the test by climbing up and down the 6 steps at their own pace and could use the handrail when necessary. The elapsed time was recorded in seconds.

BBS: BBS consists of 14 common tasks assessing static and dynamic balance. Each task is scored between 0 and 4, with 0 indicating that the task was not accomplished and 4 indicating that it was accomplished independently. The total score of the 14 tasks is summed to obtain a total score between 0 and 56. Higher scores may predict better balance performance, while scores ≤45 may predict fall risk.

Statistical Analysis

Statistical analyses were performed using the SPSS 24.0 (SPSS Inc., Chicago, IL, USA) package program. The normality of the data was tested using the Kolmogorov-Smirnov test and the data were found to exhibit a normal distribution. Descriptive statistics were presented as number (n), percentage (%), mean, standard deviation (SD), minimum (Min.) and maximum (Max.) values. Independent samples t test was used in the comparisons of scale and test results between female and male groups. Pearson correlation analysis was used to determine the correlations of the scale and test results with TSK in both groups. Statistical significance level was taken as $p<0.05$ in all analyses performed in the study.

RESULTS

In Table 1, the descriptive data of the groups are presented as mean±standard deviation.

Table 2 shows the comparison of pain, kinesiophobia and quality of life scale results between male and female groups. When the evaluations were examined, a statistically significant difference was found between the female and male groups in VAS, KOOS-PS, OKS, SF-12 PCS, SF-12 MCS, LEFS and WOMAC P., WOMAC S., WOMAC F. and WOMAC T. scores ($p<0.05$). In the TSK scale, there was no statistically significant difference between the female and male groups and the results were similar between the groups ($p>0.05$).

Table 3 includes the comparisons of the intergroup evaluations of functional test and scale results between male and female groups. Statistically significant differences were shown between male and female groups in TUG, 6MWT, 5STS, SCT and BBS ($p<0.05$).

Table 4 shows the relationship between kinesiophobia and pain, quality of life, functional test and scale results in the female group. There was a positive correlation between SCT and kinesiophobia ($p<0.05$). Although there was a positive correlation between kinesiophobia and OKS and SF-12 PCS scores, there was no statistical significance ($p>0.05$). Also, there was no statistical correlation between 6MWT, 5STS, BBS, VAS, KOOS-PS, SF-12 MCS, LEFS and WOMAC P., WOMAC S., WOMAC F. and WOMAC T. scores ($p>0.05$).

Table 5 shows the relationship between kinesiophobia and pain, quality of life, functional tests and scale results in the male group. There was a negative correlation between kinesiophobia and TUG and SF-12 PCS ($p<0.05$). There was no statistical correlation between kinesiophobia and 6MWT, 5STS, SCT, BBS, VAS, KOOS-PS, OKS, SF-12 MCS, LEFS and WOMAC P., WOMAC S., WOMAC F. and WOMAC T. scores ($p>0.05$).

Table 1. Descriptive data of female and male subject groups

	Mean	SD	Min.	Max.
Age (year)				
Female	53.90	6.81	42.00	65.00
Male	50.07	8.55	40.00	65.00
Height (cm)				
Female	162.23	5.35	150.00	175.00
Male	174.10	8.77	156.00	184.00
Weight (kg)				
Female	87.17	12.61	66.00	120.00
Male	92.07	12.41	75.00	118.00
BMI				
Female	33.14	4.61	24.24	41.52
Male	30.03	3.99	23.89	40.83
OA side	**Left**		**Right**	
Female	16 (53%)		14 (47%)	
Male	25 (83%)		5 (17%)	

BMI: body mass index, OA: osteoarthritis, SD: standard deviation, Min.: minimum, Max.: maximum

Table 2. Intergroup evaluation of pain, kinesiophobia and quality of life scale results

	Female		Male		t	ES	95% CI		p
	Mean	SD	Mean	SD			LB	UB	
TSK	42.23	8.52	38.90	8.43	1.52	0.39	-1.05	7.72	0.133
VAS	8.17	1.54	5.01	2.66	5.63	1.45	2.04	4.28	<0.001*
KOOS-PS	22.20	12.56	11.10	6.12	4.35	1.12	5.99	16.21	<0.001*
OKS	24.47	7.83	14.10	6.97	5.42	1.40	6.54	14.20	<0.001*
SF-12 PCS	29.57	7.60	40.29	9.85	-4.72	-1.22	-15.26	-6.17	<0.001*
SF-12 MCS	43.27	10.64	52.22	8.23	-3.64	-0.94	-13.87	-4.04	<0.001*
LEFS	30.03	13.80	46.63	15.58	-4.37	-1.13	-24.20	-9.00	<0.001*
WOMAC P.	9.27	3.98	5.50	4.00	3.66	0.94	1.70	5.83	<0.001*
WOMAC S.	3.43	2.30	1.77	1.92	3.04	0.79	0.57	2.76	0.004*
WOMAC F.	36.63	13.10	20.97	11.88	4.85	1.25	9.20	22.13	<0.001*
WOMAC T.	51.23	18.59	29.41	16.71	4.78	1.23	12.69	30.96	<0.001*

*p<0.05; SD: standard deviation, t: independent samples t tests results, ES: effect size, CI: confidence interval, LB: lower bound, UB: upper bound, TSK: tampa scale for kinesiophobia, VAS: visual analogue scale, KOOS-PS: knee injury and osteoarthritis outcome score physical function short form, OKS: Oxford knee score, SF-12 PCS: short form healthy survey physical, SF-12 MCS: short form healthy survey mental, LEFS: lower extremity functional scale, WOMAC P.: womac pain, WOMAC S.: womac stiffness, WOMAC F.: womac physical function, WOMAC T. womac total

Table 3. Intergroup evaluation of functional tests and BBS results

	Female		Male		t	ES	95% CI		p
	Mean	SD	Mean	SD			LB	UB	
TUG (s)	12.50	3.71	8.67	1.78	5.10	1.32	2.33	5.33	<0.001*
6MWT (m)	342.83	93.34	430.97	76.61	-4.00	-1.03	-132.27	-44.00	<0.001*
5STS (s)	23.03	8.91	14.04	2.90	5.25	1.36	5.56	12.41	<0.001*
SCT (s)	14.11	5.61	8.92	3.43	4.32	1.11	2.78	7.59	<0.001*
BBS	50.77	5.75	55.50	1.04	-4.44	-1.15	-6.87	-2.60	<0.001*

*p<0.05; SD: standard deviation, t: independent samples t tests results, ES: effect size, CI: confidence interval, LB: lower bound, UB: upper bound, TUG: timed up and go, 6MWT: 6-minute walking test, 5STS: the five repetition sit to stand test, SCT: stair-climbing test, BBS: berg balance scale

Table 4. Evaluation of the relationship between kinesiophobia and pain, quality of life, functional test and scale results in female

Correlation variable	r	p
TUG (s)	0.199	0.292
6MWT (m)	-0.012	0.950
5STS (s)	0.120	0.528
SCT (s)	0.377*	0.040*
BBS	-0.214	0.256
VAS	0.020	0.915
KOOS-PS	0.177	0.350
OKS	0.340	0.066
SF-12 PCS	-0.327	0.078
SF-12 MCS	-0.262	0.162
LEFS	-0.278	0.137
WOMAC P.	0.290	0.121
WOMAC S.	0.229	0.224
WOMAC F.	0.270	0.149
WOMAC T.	0.299	0.108

*p<0.05; TUG: timed up and go, 6MWT: 6-minute walking test, 5STS: the five repetition sit to stand test, SCT: stair-climbing test, BBS: berg balance scale, VAS: visual analogue scale, KOOS-PS: knee injury and osteoarthritis outcome score physical function short form, OKS: oxford knee score, SF-12 PCS: short form healthy survey physical, SF-12 MCS: short form healthy survey mental, LEFS: lower extremity functional scale, WOMAC P.: womac pain, WOMAC S.: womac stiffness, WOMAC F.: womac physical function, WOMAC T.: womac total

Table 5. Evaluation of the relationship between kinesiophobia and pain, quality of life, functional test and scale results in male

Correlation variable	r	p
TUG (s)	-0.368*	0.045*
6MWT (m)	-0.146	0.440
5STS (s)	-0.025	0.896
SCT (s)	0.107	0.574
BBS	0.143	0.450
VAS	0.011	0.954
KOOS-PS	0.036	0.849
OKS	0.020	0.916
SF-12 PCS	-0.535*	0.002*
SF-12 MCS	-0.205	0.277
LEFS	-0.241	0.199
WOMAC P.	0.310	0.095
WOMAC S.	-0.076	0.690
WOMAC F.	0.305	0.101
WOMAC T.	0.294	0.114

*p<0.05; TUG: timed up and go, 6MWT: 6-minute walking test, 5STS: the five repetition sit to stand test, SCT: stair-climbing test, BBS: berg balance scale, VAS: visual analogue scale, KOOS-PS: knee injury and osteoarthritis outcome score physical function short form, OKS: oxford knee score, SF-12 PCS: short form healthy survey physical, SF-12 MCS: short form healthy survey mental, LEFS: lower extremity functional scale, WOMAC P.: womac pain, WOMAC S.: womac stiffness, WOMAC F.: womac physical function, WOMAC T.: womac total

DISCUSSION

The aim of this study was to investigate the correlations between kinesiophobia levels and various pain, knee score, quality of life, balance and functional test results in male and female knee OA patients and to determine whether kinesiophobia level has a predictive effect on these parameters in OA patients.

The results showed that, in overall terms, kinesiophobia did not have a statistical correlation with pain, quality of life, knee score, balance and functional tests in OA patients. However, although limited, some scales and tests were positively or negatively correlated with kinesiophobia in both groups.

OA is primarily associated with pain, which in turn has a negative impact on flexibility, physical function and activities of daily living (26,27). In fact, several studies have reported significant correlations between the level of OA and pain (28,29). Depending on the level of pain after OA, patients may suffer from kinesiophobia. The results of our study indicate that there is no statistically significant correlation between the kinesiophobia scores obtained with the TSK and the pain scores obtained with VAS and WOMAC P. scales in both groups. Although various studies in the literature have reported significant correlations between kinesiophobia and pain level in OA patients, there are also studies in which this correlation was not found (13,21,25,26,30-32). The conflicting results in the literature regarding the correlation between kinesiophobia and pain in OA patients make it difficult to evaluate clearly between these two parameters. It is important to note, however, that the terms "presence of pain" and "severity of pain" are not synonymous (31). The absence of significant correlations in our study and in other similar studies may not be indicative of the absence of a causal relationship between pain and kinesiophobia. There are also studies emphasizing the importance of the changing nociceptive processing mechanism related to OA pain (33,34). Therefore, physical and psychosocial differences as well as nociceptive pain dominance may cause individuals to be more affected by structural and biomechanical factors (30,35).

The findings of this study indicated that OA -related kinesiophobia was not significantly correlated with various knee scores and quality of life scales as well as pain. KOOS-PS, OCS, SF-12 MCS, LEFS and WOMAC scores were not significantly correlated with kinesiophobia in both groups. However, SF-12 PCS scores were moderately negatively correlated with kinesiophobia, especially in male patients (r=-0.535, p=0.002). There was also a similar moderate correlation in female patients (r=-0.327, p=0.078). Selçuk and Karakoyun (2020) analyzed the correlations of kinesiophobia with SF-12 and WOMAC results in OA patients and found that both scales were moderate correlated with kinesiophobia (4). In a similar study, Alaca (2019) reported moderate correlations between kinesiophobia and WOMAC scores in OA patients (36). In another study, Padave et al. (2023) found a low

correlation between kinesiophobia and OKS scores in OA patients (30). Literature studies examining the correlations between the level of kinesiophobia related to OA and various scale results show variable results similar to the level of pain. This may be related to the fact that the scales included in the study consist of results based on direct self-assessment and therefore individual differences may affect the scale scores considerably.

It can be anticipated that in patients with OA, parameters related to balance, which is a fundamental prerequisite for functional movement, may be impaired (31). Therefore, it is important to examine the possible relationships between balance and kinesiophobia in OA patients. The results of our study indicated no statistically significant correlation between the BBS and TSK results. This outcome is in accordance with the findings of other studies in the existing literature (30,31). It may be thought that kinesiophobia may have an effect on balance performance, but the fact that other factors such as range of motion and muscle strength are also important factors on balance may prevent kinesiophobia from directly producing high-level effects (22).

Considering the loss of physical function and psychological effects in each joint affected by OA, differences in functional performance may be expected to occur with kinesiophobia in OA patients (37). Alshahrani et al. (2022) found a moderate significant correlation between kinesiophobia and 5STS test results in their study with OA patients (25). In another study in which the subject group consisted mostly of female OA patients, a low correlation was reported between kinesiophobia and SCT results (r=0.239, p=0.066) (30). In our study, a moderate significant correlation was found between kinesiophobia and SCT results in the female group (r=0.377, p=0.040). In a different study by Gür et al. (2021), there was no significant correlation between the same parameters (r=-0.230, p=0.341) (32). However, in the same study, moderate significant correlations were reported between kinesiophobia and both TUG and 5STS results (32). Ekediegwu et al. (2022) reported no significant correlation between kinesiophobia and TUG results in their study (38). In our study, TUG results showed a moderate negative correlation with kinesiophobia in the male group (r=-0.368, p=0.045). No significant correlations were found in other functional test results. When previous studies are examined, it is seen that the effects of kinesiophobia, especially on functional performance, reveal highly variable results. This may be related to the presence of many different important factors on functional performance and the fact that these factors may show wide differences in individuals with OA.

Although the study results showed conflicting findings regarding kinesiophobia, it is possible that this is due to various limitations of the study. These limitations include a relatively wide age range, not specifically targeting a particular level of OA, the number of subjects, and not comparing the results with age and BMI variables.

CONCLUSION

The results of the study showed that it may be conflicting to establish a direct statistical correlation between kinesiophobia and various scale and test results in OA patients. Nevertheless, the study makes an important contribution to the field in terms of revealing the variable effects of kinesiophobia. In future studies, in addition to the current parameters evaluated, direct comparison of kinesiophobia level with functional findings such as muscle strength and joint range will provide important contributions. In addition, considering that individual differences may be significant especially in studies to be conducted with OA patients, limiting the subject groups as much as possible in terms of parameters such as gender, age range and OA levels may contribute to the emergence of more clear results.

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