19.03.19

Is There a Relationship Between Kinesiophobia and Physical Activity Level in Patients with Knee Osteoarthritis?

Running Title: Knee Osteoarthritis, Kinesiophobia and Physical Activity

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Funding sources: None

Conflict of interest: The authors declared that they have no conflict of interest.

Abstract

Is There a Relationship Between Kinesiophobia and Physical Activity Level in Patients with Knee Osteoarthritis?

Objective: To investigate the levels of kinesiophobia, physical activity, depression, disability and quality of life in patients with knee osteoarthritis.

Design: A cross-sectional study.

Setting: A tertiary healthcare center.

Subjects: Ninety-six patients with knee osteoarthritis.

Methods: Pain intensity was evaluated by the Visual Analog Scale, kinesiophobia by the Tampa Scale of Kinesiophobia and Brief Fear of Movement Scale, depression by the Beck Depression Inventory, disability by the Western Ontario and McMaster Universities Arthritis Index, physical activity level by the International Physical Activity Questionnaire short form, and quality of life by the Short Form 12 Health Survey Questionnaire.

Results: Of the patients, 80.4% had high-level kinesiophobia, 61.9% had depression, and 60.4% had low, 26% moderate and 7.3% high physical activity. The pain and night pain score of the Visual Analog Scale, the Tampa Scale of Kinesiophobia and Brief Fear of Movement Scale scores, and the Western Ontario and McMaster Universities Arthritis Index and Beck Depression Inventory scores were higher in the group with high-level kinesiophobia, while the mental, physical and total scores obtained from the Short Form 12 Health Survey Questionnaire were higher in the group with low-level kinesiophobia ($P<0.05$).

Conclusions

Since the treatment of pain alone in patients with knee osteoarthritis is not sufficient to reduce

the fear of movement, we consider that approaches to increase physical activity and cognitive behavioral therapy related to fear of movement should be included in the treatment program.

Key words: Knee osteoarthritis, fear of movement, disability, Tampa, kinesiophobia

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Introduction

Knee osteoarthritis (OA) is a clinical syndrome with the pathological findings of degeneration of the joint cartilage, subchondral sclerosis, and new bone formation, presents with pain and stiffness in the joints, and causes loss of function and restrictions in activities of daily living (1). The prevalence of symptomatic knee OA is 14.9% in females, 8.7% in males, and 12.2% in the general population, and the risk of developing knee OA is increased by 12% for every one-year increase in age (2). Knee OA is radiologically classified into five grades using the Kellgren-Lawrence (KL) classification, with the radiological findings gradually deteriorating from Grade 0 to 4 (3). Studies have shown no correlation between radiological findings and pain intensity in patients with knee OA, but a weak relationship has been reported between disability and radiological findings (4). Advanced age, female gender, low level of education, high body mass index (BMI), structural damage, central and peripheral pain mechanisms, and psychological factors have been associated with pain intensity and disability in patients with knee OA (5, 6). Researchers revealed that psychological factors, such as anxiety and depression are more common in women with OA, they play a decisive role in the continuity of pain, and the rate of depression in patients with OA is 49.3% (7, 8). Although it is known that regular physical activity and specific exercises slow the progression of the disease, reduce pain, and improve function (9), physical activity levels in patients with OA are lower than in the general population and 37% are reported to be absolutely inactive (10). It has also been suggested that a sedentary lifestyle may be related to age, gender, BMI, educational status, functional limitations, availability of access to sports centers, and disorders, such as anxiety

and depression (11). Recent research in the area focus on pain catastrophizing referring to the tendency to describe pain in an amplified and worsened manner, kinesiophobia defined as developing fear-avoidance behavior against physical activity due to painful injury, and self-efficacy, which allows patients to develop positive attitudes to managing pain. Previous studies have reported that kinesiophobia is associated with high pain severity, poor functional status, and high psychological and physical disability in musculoskeletal diseases (12, 13). Fear of movement is commonly evaluated using the Tampa Scale of Kinesiophobia (TSK-17), a 17-item questionnaire; however, Shelby et al. proposed the Brief Fear of Movement Scale (BFOM), a shorter, thus clinically more practical version of TSK-17 containing six questions that are more specific to OA and reported this questionnaire to be reliable in patients with this condition. Although the importance of regular physical activity in patients with knee OA is known, and fear of movement is considered as one of the causes of physical inactivity and is widely researched in terms of its role in the pathogenesis of pain, there remains to be limited number of studies on kinesiophobia in these patients. In this study, we aimed to evaluate the levels of kinesiophobia and physical activity in patients with knee OA and to investigate whether they were associated with demographic characteristics, BMI, pain intensity, depression, disability, radiological grade, and quality of life.

Methods

Participants

A total of 96 female and male patients aged 50 to 75 years with knee OA and knee pain lasting for more than three months (knee pain intensity over 20 mm on Visual Analog Scale-VAS) were included in the study. Excluded from the study were patients with a history of

knee operation, those that had malignancies, systemic infectious disease, inflammatory disease, or fibromyalgia syndrome, those that received physical therapy and/or a knee injection within the last three months, and those having a history of using antidepressants, pregabalin or duloxetine.

Design

All patients gave informed consent before the recruitment. Ethics committee approval was obtained from Aksaray University on 19.04.2018 with decision number 2018/67. The ClinicalTrials.gov identifier of the study is NCT03875040. All the patients presenting to Aksaray Training and Research Hospital Physical Medicine and Rehabilitation Outpatient Clinic between April 2018 and October 2018, who volunteered to participate in the study and fulfilled the inclusion criteria, completed the questionnaire forms. The severity of pain at night, pain at rest and activity-related pain was evaluated by VAS, kinesiophobia by TSK-17 and BFOM, depression by the Beck Depression Inventory (BDI), disability by the Western Ontario and McMaster Universities Arthritis Index (WOMAC), physical activity level by the International Physical Activity Questionnaire (IPAQ) short form and quality of life by the Short Form 12 Health Survey Questionnaire (SF-12). Age, gender, marital status, educational status, additional disease, drug history, and sociodemographic data such as BMI were obtained from the patients and recorded in the evaluation form.

Outcome measures

TSK-17: A 17-item questionnaire based on a four-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree) used to evaluate kinesiophobia. A TSK-17 score

above 37 is considered as high-level kinesiophobia (14).

BFOM: A shorter and clinically more practical version of TSK-17, containing the TSK-17 items 1, 2, 9, 10, 14 and 15 that are more specific to OA (15).

VAS: A 10-cm line consisting of "no pain" on one end and "extreme pain" on the other, used to measure and monitor intensity of pain. The patients mark the point that best describes their pain intensity. The higher the score, the higher the intensity of pain. In the current study, we evaluated the patients' pain at night, pain at rest and activity-related pain using this tool (16).

SF-12: A scale used to evaluate the quality of life, consisting of 12 items inquiring general health, physical condition, physical limitations, mental status, social status, pain, energy and mental limitation over a total score of 100 points. SF-12 is an abbreviated version of SF-36 and has been proven to be reliable and valid. In this study, we evaluated the patients' total, physical and mental SF-12 scores (17).

BDI: A depression-rating scale consisting of 21 questions, each evaluated based on a score of 0-3. A total score of 10 or above is considered to indicate the presence of depression (18).

WOMAC: A 24-item measure that was developed to evaluate pain, joint stiffness and physical functions in individuals with knee and hip OA. A higher score indicates a higher level of pain, stiffness and functional limitation (19). In our study, we used the WOMAC total score.

IPAQ Short Form: A seven-item questionnaire that evaluates the patients' physical activity level and walking and sitting times based on the MET-min/week unit over the last seven days. According to their mean MET-min/week values obtained from this questionnaire, the patients are classified to have a low, medium or high level of physical activity (20).

Statistical Analysis

All data were analyzed using the Statistical Analysis for Social Sciences (SPSS) v. 15.0 data analysis program, and the significance level was set to $P < 0.05$. Descriptive statistics were generated for the sociodemographic data, VAS, TSK-17, BFOM, BDI, WOMAC, SF-12 and physical activity level variables. The continuous variables were presented as means ± standard deviation (SD) and ranges, and the categorical variables as absolute numbers and relative frequency. We chose to use the Kolmogorov-Smirnov test as a normality test. We employed the independent t-test for the bivariate analysis of normally distributed (age, SF-12 mental and BDI) and parametric variables, and the Mann-Whitney U and chi-square tests for non-parametric variables. We evaluated the relationship between our variables using Spearman's correlation analysis. The descriptive statistics calculated through the sample analysis examined using scatter plot and box plot methods and revealed no outliers. In the multiple regression model, the significance of the model and that of the independent variables were examined at the $P < 0.05$ significance level, and predictive equations were determined according to these criteria. Multiple regression analysis was performed to investigate the relationship between WOMAC, SF-12 physical, SF-12 mental and SF-12 total dependent variables and independent variables that were found to be significant. The strength of association was calculated using confidence interval (CI) for regression coefficients, P values, and R2.

Results

Of the 96 patients included in the study, 69.1% were female and 29.9% were male, and the mean age was 60.9 ± 7.9 years. High-level kinesiophobia was present in 80.4% of the patients

and depression in 61.9%. The level of physical activity was low in 60.4% of the patients, moderate in 26%, and high in 7.3%. The sociodemographic and descriptive data of the patients are given in Table 1. Of the female patients, 80.5% had high-level kinesiophobia and 65.6% had depression, while in male patients, the rates of high-level kinesiophobia and depression were 75.8% and 55.1%, respectively. The rates of low, moderate and high level of physical activity were calculated as 64.1%, 23.8% and 5.9%, respectively in women, and 51.7%, 31% and 10.3%, respectively in men. There was no significant difference between the female and male patients with knee OA in terms of high-level kinesiophobia (P: 0.490), depression (P: 0.118) and physical activity level (P: 0.688). Similarly, no significant difference was detected by gender concerning age and TSK-17 score; however, the female patients had a significantly higher BMI (P: 0.001) and VAS-at rest (P: 0.005), VAS-movement (P: 0.041), VAS-at night (P: 0.001), BFOM (P: 0.016), WOMAC (P: 0.008) and BDI (P: 0.034) scores, and significantly lower SF-12 physical (P: 0.046), mental (P: 0.042) and total (P: 0.028) scores compared to men. Table 2 presents the descriptive data of the female and male patients with knee OA.

There was no significant difference in the BMI value (P: 0.106) and VAS-at rest score (P: 0.727) between the patients with low and high-level kinesiophobia. Age (P: 0.000), VAS-activity related (P: 0.015), VAS-at night (P: 0.050), TSK-17 (P: 0.000), BFOM (P: 0.000), WOMAC (P: 0.000) and BDI (P: 0.015) scores were higher in patients with high-level kinesiophobia, whereas SF-12 physical (P: 0.000), mental (P: 0.004) and total (P: 0.000) scores were higher in those with low-level kinesiophobia. The rate of depression was 75.6% and 36.3% in the groups with high- and low-level kinesiophobia, respectively, and the difference was statistically significant (P: 0.013). The level of physical activity was low in 68%, moderate in 28% and high in 4% of the patients with high-level kinesiophobia, and low in 46.1%, moderate in 23% and high in 30.7% in the group with low-level kinesiophobia, with

a statistically significant difference between the two groups (P: 0.011). There was also a significant difference between the two kinesiophobia groups in terms of KL staging (P: 0.001) and educational status (P: 0.001), whereas no significant difference was observed in relation to occupation (P: 0.137). Table 3 presents the demographic and descriptive data of the knee OA groups with low- and high-level kinesiophobia.

On the BFOM scale, the most commonly approved item was "Simply being careful that I do not make unnecessary movements is the safest thing I can do to prevent the pain from worsening", with which more than half (68.1%) of the participants agreed or strongly agreed. The least commonly approved item was "If I were to try to overcome it, my pain would increase". Only 36.1% of the participants agreed or strongly agreed with this item (Table 4).

BMI, VAS-at rest, VAS-activity related, VAS-at night, TSK-17, BDI and BFOM scores, KL grade and physical activity level were correlated with WOMAC and SF-12 physical scores ($P < 0.05$). The SF-12 mental and SF-12 total scores were additionally correlated with age ($P < 0.05$), but not with BMI ($P > 0.05$), in contrast to WOMAC and SF-12 physical scores. The results of correlation analysis in patients with knee OA are given in Table 5.

TSK-17 was correlated with WOMAC, SF-12 physical, mental and total, BDI and BFOM scores and presence of depression in women with knee OA ($P < 0.05$), and with age, BFOM, BDI, SF-12 physical and total scores in men with knee OA ($P < 0.05$). BFOM was correlated with age, VAS-activity related, VAS-at night, TSK-17, WOMAC, SF-12 physical, mental and total and BDI scores and high-level kinesiophobia in female patients and with age, TSK-17, SF-12 physical and total scores, and high-level kinesiophobia in male patients. Table 6 presents the correlation data for TSK-17 and BFOM in male and female patients with knee OA.

According to the data obtained from the multiple regression analysis (Table 7), it was concluded that independent variables KL grade, TSK-17 score and TSK-17 item 15 score

predicted the WOMAC dependent variable (rate of explanation: 51.7%, 95% CI for β); the independent variable KL grade predicted the SF-12 physical dependent variable (41.6%, 95% CI for β); the independent variable BDI score predicted the dependent variable SF-12 mental score (38.7%, 95% CI for β); and the independent variables KL grade and BDI score predicted the dependent variable SF-12 total score (56.5%, 95% CI for β). However, age, BMI, VAS-at rest, VAS-at night, VAS-activity related, BDI and BFOM scores, educational status, occupation, physical activity level, and scores of TSK-17 items 1, 2, 9, 10 and 14 did not significantly predict WOMAC scores ($P > 0.05$). Similarly, age, BMI, VAS-at rest, VAS-at night, VAS-activity related, TSK-17 and BFOM scores, educational status, occupation and physical activity level did not significantly predict the SF-12 scores ($P > 0.05$).

Discussion

We determined that the rates of kinesiophobia, depression and physical inactivity were significantly high in patients with knee OA, and there was a significant relationship between BMI, pain intensity, depression, kinesiophobia, KL grade and physical activity level in these patients. Thompson et al. (21) reported that 65% of the participants were obese or morbidly obese, 23% were overweight, and the mean BMI was 33 kg/m^2. In our study, 39.5% of the patients were overweight, 55.1% were obese or morbidly obese, and the mean BMI was calculated as 31.2 kg/m^2. In a study evaluating 358 patients with knee and hip OA, the mean BMI score was 29.7 in females and 28.9 in males, but there was no significant difference in BMI between men and women (22). In the current study, the mean BMI of female patients was significantly higher than that of males. However, BMI did not significantly differ between patients with high- and low-level kinesiophobia. Although research on kinesiophobia in patients with knee OA is limited, a few published studies reported that pain catastrophizing

affects pain intensity, walking speed, and psychological and physical disability in obese knee OA cases (13, 23). It was also noted that in patients with knee OA, a high BMI was correlated with lower physical performance (6), and regular exercise was useful in improving functional status and reducing pain (24). Similar to the literature, we observed that BMI was related to disability in patients with knee OA.

As reported in the literature, we determined that the KL grade was significantly associated with disability and quality of life and was significant in predicting these parameters (5, 6). The KL grade was significantly higher in patients with high-level kinesiophobia than those with low-level kinesiophobia, but no significant relationship was detected between kinesiophobia and KL grade.

In a previous study, it was reported that 27.5% of the patients had finished primary school, 52.9% completed middle school, and 19.6% were university graduates (22). The educational level of the patients included in our study was much lower compared to the literature. The educational level of the patients with high-level kinesiophobia was lower than those with low-level kinesiophobia, but no significant relationship was found between kinesiophobia and educational status.

In this study, we found that the activity-related pain score was higher than the pain at night and pain at rest scores, and pain intensity was higher in female patients compared to males. It has been previously reported that gradually increased physical activity worsened pain intensity in patients with knee pain (25-30), and knee OA cases with a high level of pain catastrophizing had greater activity-related pain intensity (31). In consistent with the literature, we determined that activity-related knee pain was significantly higher in patients with high-level kinesiophobia compared to those with low-level kinesiophobia. Furthermore, night pain was slightly more intense in the former group, but no significant difference was detected between the two groups in terms of pain at rest. While there was no significant

relationship between the TSK-17 score and pain intensity in women, the BFOM score was significantly correlated with night pain and activity-related pain. In male patients, there was no significant relationship between pain intensity and TSK-17 and BFOM scores. The results also revealed that in patients with knee OA, activity-related, night and rest pain were significantly correlated with disability and quality of life but were not effective in predicting these variables. Based on this result, we consider that in knee OA cases, treatment of pain alone is not sufficient to reduce disability and improve quality of life.

In a study by Baert et al., the mean TSK-17 score was found to be 37.1 in symptomatic patients with knee OA, and it was reported that kinesiophobia was related to pain intensity but not disability (32). In two other studies investigating knee OA, the mean TSK-17 score was reported as 41 and 34.1, and kinesiophobia and disability were found to be related (21, 33). In the current study, we determined a higher mean TSK-17 score compared to the literature. Although the TSK-17 score was higher in females than in males with knee OA, there was no statistically significant difference between the two groups. There was a strong relationship between the TSK-17 score and disability and quality of life in patients with knee OA. The TSK-17 score was additionally correlated with depression in female patients, and age and depression in male patients, but no significant relationship existed between TSK-17 and disability in the latter. Similar to the literature, we found that disability and quality of life were correlated with kinesiophobia; however, we did not observe a significant relationship between pain intensity and kinesiophobia.

In the multiple regression analysis, the TSK-17 score and the score obtained from the item, “I can’t do all the things normal people do because it’s too easy to get injured” corresponding to TSK item 15 and BFOM item 6 predicted disability, but not quality of life in this patient group. According to the TSK-17 score, in patients with high-level kinesiophobia, age, activity-related pain intensity, disability, depression, and KL grade were higher and physical

activity level, quality of life and educational status were lower compared to those with low-level kinesiophobia.

More than half of the patients agreed or strongly agreed with the BFOM items, “Simply being careful that I do not make unnecessary movements is the safest thing I can do to prevent pain from worsening” (68.1%), “I am afraid that I may injure myself accidently” (67%), and “I can’t do all the things normal people do because it’s too easy to get injured” (63.9%). Similarly, Gunn et al. evaluated 350 knee OA cases (71.7% women) with a mean age of 65.3 years and reported that 58.1% of the patients agreed or strongly agreed with the BFOM item, “Simply being careful that I do not make unnecessary movements is the safest thing I can do to prevent pain from worsening”. The authors also noted that fear of movement was less seen in patients with a better functional status and higher in females than in males, and BFOM was appropriate and practical in evaluating fear of movement in patients with knee OA (34). In another study, Shelby et al. assessed fear of movement using TSK-17 and BFOM in 1,136 patients with hip and knee OA (68.7% women) with a mean age of 71.5 years. They found a positive relationship between pain catastrophizing and pain intensity, and a negative relationship between the BFOM scores and physical-mental functions and WOMAC scores. The authors concluded that BFOM was correlated with physical and psychological functional status and pain, and was a valid tool for assessing fear of movement in patients with knee OA (15). Similar to the studies mentioned above, we observed that the BFOM score was higher in female patients with knee OA than in male cases and was associated with disability in women. Unlike the literature, we detected no relationship between BFOM and disability in male patients. In addition, the BFOM score was positively correlated with age, activity-related pain, night pain and depression, and negatively correlated with quality of life in women, and positively correlated with age and negatively correlated with quality of life in men. Although the BFOM score was correlated with quality of life and disability in patients with knee OA, it

predicted neither of these variables. The patients with high-level kinesiophobia based on the TSK-17 score had a significantly higher BFOM score than those with low-level kinesiophobia. Gunn et al. concluded that in patients with knee OA, adoption of joint protection strategies and avoidance of behavior with high potential of damage to joints is part of the disease management, but in some patients, pain-related fear leads to a general limitation of movement and a sedentary lifestyle (34). Somers et al. also reported that individuals with pain-related fear exhibited fear avoidance behavior and low physical activity levels, supporting the data obtained from the current study (13). Our multiple regression analysis revealed that the KL grade, kinesiophobia and TSK-17 item 15/BFOM item 6 ("I can't do all the things normal people do because it's too easy to get injured") successfully predicted disability, and KL grade and depression were effective in predicting quality of life; however, the remaining variables did not adequately predict either parameter. In the literature, in contrast to many studies associating fear of movement with low functional status (13, 34, 35), Gunn et al. did not detect a significant association between pain and fear of movement in multiple regression analysis despite the presence of a significant relationship in the paired analysis, and thus noted that reducing pain alone was not sufficient to manage fear of movement (34). In the current study, consistent with the literature, we observed that radiological findings were correlated with disability (4) and quality of life, and depression negatively affected quality of life (13).

Gay et al. (36) evaluated 548 knee OA patients comprising 73.9% women, with a mean age of 67.6 years, reporting that the physical activity level was low in 18.8% of the patients, moderate in 38.6%, and high in 42.6%. In the current study, the physical activity level of the patients was significantly lower compared to the previous study, and we found no significant difference in physical activity level between male and female patients. In a study of 55 patients over 65 years of age, the BDI and WOMAC scores were higher and the SF-36 score

was lower in the physically inactive group (37). In our study, the physical activity level was significantly lower in those with high-level kinesiophobia than those with low-level kinesiophobia, but we observed no significant relationship between the physical activity level and TSK-17 and BFOM scores. It was previously reported that high-level pain catastrophizing was correlated with a low level of physical activity (38-42), and patients with OA tended to avoid painful physical activity with the idea that it might increase the pain or severity of their disease (13, 43-45) and exhibited sedentary behavior (46). In contrast, we determined that although the physical activity level was correlated with disability and quality of life in patients with knee OA, it did not sufficiently predict these two parameters.

It was previously reported that psychological factors, such as anxiety and depression were more common and played a decisive role in the continuity of pain in women with OA, and the rate of depression in patients with knee OA was 49.3% (7, 8). Researchers also noted that patients with depressive symptoms had greater fear of movement compared to those with exercise-related self-efficacy (13, 23, 35). Pain catastrophizing and pain-related fear were shown to be correlated with psychological disability in patients with knee OA, psychological disability was more common in patients with a high level of pain (13), and the BFOM score was moderately correlated with pain and psychological functions (13, 23). In the current study, we observed a higher rate of depression in women than in men and in patients with high-level kinesiophobia compared to those with low-level kinesiophobia. Depression was correlated with both TSK-17 and BFOM scores in women, whereas it was only correlated with the TSK-17 score in men. The literature contains studies supporting that psychological factors, such as affective, cognitive and behavioral variables are predictors of pain and disability in patients with OA (12, 47). We determined that depression was correlated with both disability and quality of life in patients with knee OA, but it was only valuable in predicting quality of life and not sufficient to predict disability. It was previously reported that

pain catastrophizing was a determinant of pain development, and therefore it should be evaluated as a risk factor for the chronicity of pain in patients with OA (13).

Alkan et al. noted that all scores related to the SF-36 assessment were lower in patients with knee OA compared to the healthy controls, and quality of life was correlated with pain intensity and disability (48). Webster et al. compared SF-12 and SF-36 scores in patients with knee OA who had undergone replacement surgery and reported that SF-12 was a more practical and appropriate evaluation method in these patients (49). Vennu et al. assessed quality of life of 4,484 patients with knee OA using SF-12 and reported the scores as 47.3 ± 9.3 and 53.0 ± 8.6 for the physical and mental components, respectively (50). In our study, the quality of life of patients with knee OA was significantly lower than in the literature. Furthermore, the quality of life was worse than that of males and it was significantly lower in patients with high level kinesiophobia than those with low level kinesiophobia. The TSK-17 and BFOM scores were correlated with the SF-12 total, physical and mental scores in female patients, and the SF-12 total and physical scores in male patients. Depression was valuable in predicting the mental component of SF-12, and the KL grade successfully predicted the physical component of SF-12.

The small size of the sample, lower number of male patients, absence of a control group, and higher number of patients with high-level kinesiophobia than those with low-level kinesiophobia are among the limitations of the current study.

Conclusions

Fear of movement is a condition commonly seen in patients with knee OA and may cause disability and physical inactivity. Since physical activity is an important component in the management of knee OA, the treatment outcomes may be poor in patients with fear of

movement. Considering that in patients with knee OA, treatment of pain alone is not sufficient to reduce fear of movement, we suggest that approaches to increase physical activity and cognitive behavioral therapy to overcome this fear should be included in the treatment program.

Acknowledgments: None

Conflict of Interest: There was no conflict of interest.

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Table 1. Sociodemographic and descriptive data of the patients with knee osteoarthritis

Characteristics	Frequency (n/%)	Characteristics	Value (Mean±SD)
Gender (F/M)	67 (69.1)/ 29 (29.9)	**Age**	60.92±7.99
Level of Education		**BMI**	31.28±4.70
No formal education	33 (34.3)	**VAS**	
Primary School	40 (41.6)	VAS-at rest	36.77±24.51
Middle School	12 (12.5)	VAS-activity related	72.13±17.70
High School	5(5.2)	VAS-at night	72.13±17.70
University	6(6.2)	**TSK-17**	40.72±14.05
Occupation		**BFOM**	14.58±5.85
Unemployed	82(85.4)	**Kinesiophobia rate (n/%)**	78 (80.4)
Desk work	2 (2.0)	**WOMAC total**	51.00±22.37
Physical work	12(12)	**BDI**	12.43±8.84
BMI Evaluation		**Depression rate (n/%)**	60 (61.9)
Underweight	1 (1)	**SF-12**	
Normal weight	4 (4.1)	SF-12 physical	9.36±3.65
Overweight	38(39.5)	SF-12 mental	13.57±5.63
Mildly obese	51(53.1)	SF-12 total	22.93±8.89
Morbid obese	2 (2)	**Physical activity (n/%)**	
KL Classification		Low	58 (60.4)
Grade 1	7 (7.2)	Moderate	25 (26)
Grade 2	47(48.9)	High	7 (7.3)
Grade 3	36(37.5)		
Grade 4	4 (4.1)		

F: Female, M: Male, BMI: Body Mass Index, KL: Kellgren-Lawrence Classification, VAS: Visual Analog Scale, TSK-17: Tampa Scale of Kinesiophobia, BFOM: Brief Fear of Movement Scale, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire.

Table 2. Evaluation of parameters by gender in patients with knee osteoarthritis

Parameters (mean±SD)	**Female (n:67)**	**Male (n:29)**	**P**
Age	60.598.00	61.65±8.08	0.555
BMI	32.35±4.53	28.81±4.19	0.001
VAS-at rest	45.52±27.09	28.96±23.04	0.005
VAS-activity related	74.55±16.71	66.55±18.95	0.041
VAS-at night	53.73±26.31	33.79±28.33	0.001
TSK-17	44.77±8.87	42.00±7.06	0.154
BFOM	16.59±3.91	14.37±3.84	0.016
Kinesiophobia rate (n/%)	54(80.5)	22(75.8)	0.490
WOMAC total	54.95±22.78	41.88±18.75	0.008
BDI	15.31±8.69	11.33±5.92	0.034
Depression rate (n/%)	44(65.67)	16(55.1)	0.118
SF-12 physical	9.74±2.63	10.92±2.46	0.046
SF-12 mental	14.03±4.29	16.03±4.02	0.042
SF-12 total	23.77±6.39	26.96±5.73	0.028
Physical activity (n/%)			0.688
• Low	43(64.1)	15 (51.7)	
• Moderate	16 (23.8)	9 (31)	
• High	4 (5.9)	3 (10.3)	

BMI: Body Mass Index, VAS: Visual Analog Scale, TSK-17: Tampa Scale of Kinesiophobia, BFOM: Brief Fear of Movement Scale, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire.

Table 3. Sociodemographic and descriptive data of the patients with knee osteoarthritis according to their level of kinesiophobia (n: 89)†

Parameters	**High-level kinesiophobia (n:76)**	**Low-level kinesiophobia (n:13)**	**p**
Age	62.01±8.28	55.07±3.09	0.000
BMI	31.57±4.90	29.42 ±4.08	0.106
VAS-at rest	43.28±26.35	31.53±24.09	0.136
VAS-activity related	74.73±16.77	62.30±15.89	0.015
VAS-at night	50.46±27.83	33.84±27.54	0.050
TSK-17	46.55±5.54	28.61±5.56	0.000
BFOM	17.05±3.01	9.30±2.21	0.000
WOMAC total	55.01±19.90	27.20±20.44	0.000
BDI	14.86±8.12	8.54±5.57	0.015
Depression rate (n/%)	56(75.6)	4(36.3)	0.013
SF-12 physical	9.60±2.27	13.00±2.85	0.000
SF-12 mental	14.06±4.08	17.76±4.34	0.004
SF-12 total	23.66±5.8	30.76±6.33	0.000
Physical activity (n/%)			0.011
Low	51 (68)	6 (46.15)	
Moderate	21 (28)	3 (23.07)	
High	3 (4)	4 (30.76)	
BMI Evaluation (n/%)			0.727
Underweight	1(1.3)	0(0)	
Normal weight	3(3.9)	1(7.6)	
Overweight	29(38.1)	7(53.8)	
Mildly obese	41(53.9)	5(38.4)	
Morbidly obese	2(2.6)	0(0)	
KL Classification (n/%)			0.001
Grade 1	3(3.9)	3(23)	
Grade 2	33(43.4)	10(76.9)	
Grade 3	36(47.3)	0(0)	
Grade 4	4(5.2)	0(0)	
Level of Education (n/%)			0.001
No formal education	25 (32.8)	5 (38.4)	
Primary School	36 (47.3)	1 (7.6)	
Middle School	9 (11.8)	2 (15.3)	
High School	4 (5.2)	1 (7.6)	
University	2 (2.6)	4 (30.7)	
Occupation (n/%)			0.137
Unemployed	66 (86.8)	11 (84.6)	
Desk job	1 (1.3)	1 (7.6)	
Physically demanding job	9 (11.8)	1 (7.6)	

†: Seven participants had incomplete responses in TSK-17.

BMI: Body Mass Index, VAS: Visual Analog Scale, TSK: Tampa Scale of Kinesiophobia, BFOM: Brief Fear of Movement Scale, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire.

Table 4. Distribution of the patients' responses to the items in the Brief Fear of Movement Scale (n: 89†)

Item	Strongly agree, %	Agree, %	Disagree, %	Strongly disagree, %
I am afraid that I may injure myself if I exercise (TSK 1)	17.5	21.6	28.9	22.7
If I were to try to overcome it, my pain would increase (TSK 2)	6.2	29.9	35.1	19.6
I am afraid that I might injure myself accidently (TSK 9)	33.0	34.	15.5	8.2
Simply being careful that I do not make unnecessary movements is the safest thing I can do to prevent pain from worsening (TSK 10)	25.8	42.3	14.4	8.2
It's really not safe for a person with a condition like mine to be physically active (TSK 14)	9.3	38.1	26.8	16.5
I can't do all the things normal people do because it's too easy to get injured (TSK 15)	29.9	34.0	21.6	5.2

†: Seven participants had incomplete responses in BFOM.

Table 5. Parameters correlated with disability and quality of life in patients with knee osteoarthritis (n: 85†)

Parameters		**WOMAC total**	**SF-12 physical**	**SF-12 mental**	**SF-12 total**
Age	r	.199	-.454	-.259	-.351
	p	.068	.000	.017	.001
BMI	r	.304	-.004	-.163	-.127
	p	.005	.973	.135	.245
VAS-at rest	r	.427	-.471	-.419	-.480
	p	.000	.000	.000	.000
VAS-activity related	r	.422	-.565	-.432	-.516
	p	.000	.000	.000	.000
VAS-at night	r	.390	-.428	-.423	-.474
	p	.000	.000	0.000	.000
KL grade	r	.489	-.651	-.518	-.611
	p	.000	.000	.000	.000
TSK-17 score	r	.526	-.334	-.409	-.423
	p	.000	.002	.000	.000
BDI score	r	.470	-.451	-.646	-.619
	p	.000	.000	.000	.000
Physical activity level	r	-.422	.628	.515	.604
	p	.000	.000	.000	.000
BFOM score	r	.499	-.475	-.504	-.545
	p	.000	.000	.000	.000

†: Correlation analyses conducted for 85 patients.

BMI: Body Mass Index, VAS: Visual Analog Scale, TSK: Tampa Scale of Kinesiophobia, BFOM: Brief Fear of Movement Scale, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire, KL: Kellgren-Lawrence Classification.

Table 6. Parameters correlated with TSK and BFOM scores in patients with knee osteoarthritis

		Female				Male	
Parameters		**TSK**	**BFOM**			**TSK**	**BFOM**
Age	r	0.039	0.370	Age	r	0.511	0.492
	p	0.761	0.003		p	0.006	0.009
VAS-activity related	r	0.155	0.417	TSK-17	r	1.000	0.776
	p	0.228	0.001		p	.	0.000
VAS-at night	r	0.051	0.282	Kinesiophobia rate	r	0.679	0.615
	p	0.692	0.028		p	0.000	0.001
TSK-17	r	1.000	0.709	SF-12 physical	r	-0.458	-0.518
	p	.	0.000		p	0.016	0.006
Kinesiophobia rate	r	0.582	0.578	SF-12 total	r	-0.430	-0.475
	p	0.000	0.000		p	0.025	0.012
WOMAC total	r	0.527	0.489	BDI	r	0.405	0.346
	p	0.000	0.000		p	0.036	0.077
SF-12 physical	r	-0.311	-0.444	Depression rate	r	0.381	0.379
	p	0.015	0.000		p	0.050	0.051
SF-12 mental	r	-0.450	-0.521	BFOM	r	0.776	1.000
	p	0.000	0.000		p	0.000	.
SF-12 total	r	-0.435	-0.547				
	p	0.000	0.000				
BDI	r	0.364	0.404				
	p	0.005	0.002				
Depression rate	r	0.339	0.353				
	p	0.009	0.006				
BFOM	r	0.709	1.000				
	p	0.000	.				

VAS: Visual Analog Scale, TSK: Tampa Scale of Kinesiophobia, BFOM: Brief Fear of Movement Scale, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire.

Table 7. Multivariable associations of patient characteristics with WOMAC and SF-12 physical, mental and total scores.

Independent variables	**Dependent variables**											
	WOMAC			**SF-12 physical**			**SF-12 mental**			**SF-12 total**		
	β (95% CI) (lower, upper)	**p**	**r^2**	**β (95% CI) (lower, upper)**	**p**	**r^2**	**β (95% CI) (lower, upper)**	**p**	**r^2**	**β (95% CI) (lower, upper)**	**p**	**r^2**
KL grade	4.843-20.367	0.002	0.624	-2.987 -1.760	0.000	0.416	-	-	-	-5.726 -2.946	0.000	0.565
TSK score	0.715-2.745	0.001	0.624	-	-	-	-	-	-	-	-	-
TSK question 15	-14.970 -0.173	0.045	0.624	-	-	-	-	-	-	-	-	-
BDI score	-	-	-	-	-	-	-0.422 -0.240	0.000	0.387	-0.459 -0.219	0.000	0.565

KL: Kellgren-Lawrence Classification, TSK: Tampa Scale of Kinesiophobia, WOMAC: Western Ontario and McMaster Universities Arthritis Index, BDI: Beck Depression Inventory, SF-12: Short Form-12 Health Survey Questionnaire, CI: Confidence Interval.