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ORIGINAL ARTICLE

Knee osteoarthritis emotional meaning scale development study

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Abstract

Background: Knee osteoarthritis (OA) is a chronic, long-term disease with both physical and psychosocial consequences. In determining the treatment programs of patients diagnosed with knee OA and ensuring compliance with treatment, it is important to understand the emotional attitudes and experiences of patients regarding the physical and psychosocial effects of the disease. This study aimed to create a scale for evaluating the emotional attitudes of patients with knee OA as they manage and cope with the condition.

Methods: The research was a validity and reliability study designed using methodological methods. Study data were collected from the Department of Physical Therapy and Rehabilitation at a university hospital in Turkey between November and December 2024. The study sample included 90 patients diagnosed with knee OA. To establish the validity of the scale, content validity and construct validity were assessed. Internal consistency was determined using Cronbach's alpha reliability coefficient, item-total score correlations, and the Hotelling T^2 test. The test–retest method was applied to determine the scale's stability over time.

Results: The content validity index (CVI) values for the draft form of the scale ranged between 0.91 and 1.00. The exploratory factor analysis indicated that the scale consisted of a single factor, which explained 41.62% of the total variance. The scale demonstrated strong reliability, with a Cronbach's alpha coefficient of 0.86, item-total correlations ranging from 0.36 to 0.73, and a significant Hotelling T^2 value ($P < 0.001$). Test–retest analysis indicated a positive and highly significant correlation for the overall scale ($r = 0.964$, $P < 0.001$).

Conclusion: The knee osteoarthritis emotional meaning scale (KOEMS) was demonstrated to be a valid and reliable instrument for this patient sample.

Key words: *emotional meaning, knee osteoarthritis, reliability, validity.*

INTRODUCTION

Osteoarthritis (OA) is a chronic musculoskeletal condition characterised by progressive degeneration of joint cartilage, joint space narrowing, and osteophyte formation, posing a significant health concern.[1,2] Among peripheral joints, OA is most commonly seen in the knee joint, accounting for 60%–85% of total OA cases.[1–3] The prevalence of knee OA increases with age, affecting 10%–25% of women and 5%–15% of men over 60.[4] Key risk factors for knee OA include age, gender, obesity, genetic predisposition, developmental issues, hypermobility, trauma, joint structural features, and occupational factors.[1–3,5] Symptoms include pain, stiffness, limited movement, crepitation, and a reduced ability to perform daily activities, negatively impacting quality of life.[2–4] These symptoms can also elevate the risk of other conditions, such as cardiovascular disease, diabetes, anxiety, and depression.[6] The main treatment goals for knee OA include pain relief, reducing stiffness, enhancing quality of life, preserving joint function and

muscle strength, preventing injuries, and avoiding treatment complications.[7–10] Treatment involves pharmacological, non-pharmacological, and surgical approaches.[9–12] Training programs that include clinical findings of knee OA, treatment, regulation of lifestyle and physical activities, pain management strategies, the importance of weight control and diet, ergonomic and environmental adjustments, joint protection techniques, and the significance of exercise are among the main recommendations for treatment in current OA guidelines.[2,3,8,9,11]

Since knee OA is considered a non-life-threatening condition, it is often given lower priority by healthcare providers and patients compared to other chronic conditions.[13,14] The prevailing belief that knee OA is a natural part of ageing, along with the tendency to regard it as a normal consequence of getting older, contributes to patients' hesitancy to seek treatment.[15] For knee OA patients, losing weight, altering lifestyle habits, and engaging in exercise therapy require significant behavioural changes which make it a challenging process.[16] Therefore, understanding the attitudes and perceptions of knee OA patients toward the disease and its treatment is crucial for effective treatment planning and management.

Knee OA is one of the leading causes of physical disability and impairment in activities of daily living among older adults. Studies have determined that these patients experience a decreased quality of life due to chronic pain, loss of physical function, and social isolation, and are more likely to encounter psychological and emotional difficulties, such as depression, anxiety, and stress.[17-21]

A systematic review and meta-analysis by Stubbs et al. reported that 19.9% of individuals with OA had depressive symptoms, and 21.3% had anxiety symptoms.[22]

In Küçükşen et al.'s study, depression was shown to be a common comorbidity in older adults with knee OA.[23]

Studies have determined that depressive symptoms in individuals with knee OA have a negative effect on knee pain and physical function and significantly increase the OA burden.[21,24]

Smith *et al*.'s study on patients' views of living with hip and/or knee OA found that factors like understanding the disease, perceptions of others' views, and the activity limitations caused by OA contributed to negative attitudes.[7] Wride *et al*.'s meta-analysis also revealed that many individuals with knee pain struggled to adapt to normal life, experienced emotional distress, including fear and anxiety, and had heightened concerns about the future.[25] Wallis *et al*.'s systematic review on living with knee OA highlighted the emotional toll of the disease, with participants reporting feelings of loss, anxiety, inadequacy, frustration, and depression. Some felt that their mobility limitations diminished their self-worth and identity.[26] Chan and colleagues found that the unpredictability and uncertainty of living with knee OA were particularly stressful.[27] Another study showed that patients dreamed of returning to their previous activity levels but found their knee condition to be a major obstacle.[28]

Knee OA is a chronic, long-term condition that has both physical and psychosocial consequences.[6]

Current evidence-based guidelines for the treatment of knee OA state that a multidisciplinary treatment approach that includes patient education, psychosocial support, physical activity, self-management, and cognitive behavioral therapies can be effective in coping with the disease in both its physical and emotional aspects.[8,11,29]

Therefore, determining the experiences, emotional attitudes, and perceptions of knee OA patients regarding the disease and treatment is important for developing strategies to cope with the disease and determining individualized treatment programs.

In the literature, it is observed that in determining the emotional attitudes of knee OA patients, sub-dimensions of some psychological assessment tools, such as depression, anxiety, and quality of life scales, are widely used, or qualitative research findings are utilized.[6,23,26-28]

A literature review conducted using databases such as PubMed, MEDLINE, and Web of Science revealed no studies aimed at measuring and evaluating the emotional attitudes of patients diagnosed with knee OA in coping with the disease. It has been identified that there is a need for tools to comprehensively determine emotional states in this context.

This study aims to develop a scale to evaluate the emotional attitudes of knee OA patients as they cope with their condition.

METHODS

Study design

This research was a validity and reliability study designed using methodological methods, and was

conducted in two stages. In the first stage, a scale was developed, while in the second stage, the validity and reliability of the developed scale were assessed.

Stage 1: scale development

This stage consists of the following steps: item pool creation, content validity evaluation of draft form, and administering the pilot test.

Item pool creation

The draft form of the knee osteoarthritis emotional meaning scale (KOEMS) was developed by the researchers based on existing literature. Studies published between 2014 and 2024 were reviewed for this purpose. The item pool was formed by identifying descriptive adjectives that reflect the emotional states experienced by patients with knee OA, with the aim of stimulating the patients' internal resources to promote health restoration and encourage active participation in their own care.[2,3,9–11,25,26] From these adjectives, 12 adjective pairs were selected to form the basis of the scale, resulting in the creation of a draft form. The structural framework of the scale was developed using the Osgood Emotional Meaning Scale, which was created by Osgood, Suci, and Tannenbaum in 1957. This scale examines the semantic values an individual associates with their attitudes and has a bipolar structure, with adjectives at both ends representing the most positive and most negative feelings. The scale consists of seven categories between these extremes and is designed to measure individuals' emotional values. The scale assumes equal distances between the scores. For scoring, if the patient's score falls within the 7, 6, or 5 options, it is interpreted as a positive attitude; if it falls within option 4, it is considered neutral; and if the score is in the 3, 2, or 1 options, it is evaluated as a negative attitude.[30]

Content validity

The draft form was reviewed by experts to evaluate the content validity of the scale. It is recommended that the expert group consist of at least three and no more than 20 individuals.[31,32]

For this reason, 15 people who were experts in the fields of osteoarthritis, rheumatology, geriatrics, and emotional states in the elderly were invited, and 12 of them responded.

In this study, 12 experts were consulted, including three from each of the following doctoral programs: Internal Medicine Nursing, Psychiatric Nursing, Surgical Diseases Nursing, and Public Health Nursing. Content validity index (CVI) values were assessed by the Davis method for content validity. These values ranged from 0.91 to 1.00, demonstrating that the items effectively captured the intended concepts, as indicated by values exceeding 0.80.[31,33,34,35] The level of agreement among expert opinions was analyzed using Kendall's W test, a non-parametric test.[30,35] The results revealed no significant difference between the scores provided by the experts (Kendall's $W = 0.76$; $P = 0.530$; $P > 0.05$). No changes were made to the draft form based on the CVI results.

Face validity

Following the content validity review, a pilot test was conducted with 20 patients who had similar characteristics to the intended sample group to assess the clarity and understandability of the scale items. These patients were not included in the final sample group.[32,36] No changes were made to the scale items after the pilot test.

Final scale

The final version of the KOEMS is one-dimensional and consists of 12 items. It uses adjectives at both ends of the scale to represent the most positive and most negative feelings. The scale includes seven categories between these extremes, and it is assumed that the distance between scale scores is equal. Scoring is as follows: a score of 7, 6, or 5 indicates a positive attitude, a score of 4 represents a neutral attitude, and scores of 3, 2, or 1 suggest a negative attitude. No specific cut-off point is established for the scale.

Stage 2: evaluation of the scale's psychometric properties

In this stage, the validity and reliability of the KOEMS were assessed.

Exploratory factor analysis (EFA) is a statistical method used to understand and explain the factor structure of newly developed scales. For this reason, EFA analysis was conducted in the study to determine the factor structure of the scale

Additionally, EFA is a commonly preferred method, especially in cases where a theoretical model is not available, the factor structure has not been previously determined, or the structure is unknown. Therefore, an explanatory approach was adopted since there was insufficient theoretical knowledge and assumptions regarding the overall structure of the scale. To assess the reliability of the scale, Cronbach's alpha reliability coefficient, item-total score reliability, and test-retest reliability methods were employed.[30,37,38]

Study setting and participants

The study was conducted in the Department of Physical Therapy and Rehabilitation at a university hospital in western Turkey between November and December 2024. The inclusion criteria for participants were as follows:

- a diagnosis of knee OA
- no physical limitations caused by other health conditions
- no communication difficulties
- willingness to participate in the study.

Following guidelines that recommend a sample size of 5–10 times per the number of scale items,[32,39] 90 patients were included.

Data collection tools

Patient information form: this form collected demographic and clinical data, including age, gender, education level, occupation, affected knee joint, family history of OA, history of knee trauma, and use of walking aids.

KOEMS draft form: a preliminary version of the scale designed to capture the emotional meaning of knee OA.

Data collection process

Data were gathered through face-to-face interviews conducted by researchers. Participants completed the survey in a quiet environment, with the process taking 5–10 min per individual.

Data analysis

The data were analyzed using IBM SPSS Statistics 29, employing the following methods.

Descriptive statistics: basic descriptive measures such as frequencies, percentages, arithmetic means, and standard deviations were calculated.

Validity analysis

- Content validity: CVI and Kendall's coefficient of concordance (Kendall's W) were calculated using the Davis method.
- Construct validity: EFA was conducted with a factor loading threshold set at 0.30.[40] The scale's suitability for EFA was assessed using the Kaiser–Meyer–Olkin (KMO) test.[41]

Reliability analysis:

- Internal consistency: Cronbach's alpha reliability coefficient was calculated. Item-total score correlations were examined, with a minimum threshold of 0.25 Hotelling's T^2 test also used to evaluate consistency.[41]
- Test–retest reliability: the scale's stability over time was assessed using Pearson's product–moment correlation to determine correspondence between test and retest scores. The dependent samples *t*-test was applied to evaluate any differences between these scores.[37]

Ethical considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethics approval was granted by the Medical Ethics Committee of Pamukkale University (IRB number: E-60116787-020-610 205, approval date: 12.11.2024). Institutional permissions were also obtained. Participants were fully informed about the study, and written and verbal consent were collected from those who agreed to participate.

RESULTS

Descriptive characteristics

The descriptive characteristics of patients diagnosed with knee OA are summarised in Table 1. The mean age of the patients participating in the study was 56.21 ± 7.42, 87.8% were female, 58.9% were primary school graduates, and 57.8% were housewives. It was determined that 66.7% of the patients had both knees affected, 62.2% had OA in their families, 80% had no history of impact to the knee, and 96.7% did not use a walking aid.

Validity and reliability estimates

Validity

Preliminary analysis involved assessing the data's suitability for factor analysis using the KMO test and

Table 1 Patients' characteristics ($N = 90$)

Characteristics	Mean	SD
Age (years)	56.21	7.42
	Number	Percentage
Gender		
Famele	79	87.8
Male	11	12.2
Education		
Elementary education	53	58.9
Secondary education and above	37	41.1
Employment status		
Housewife	52	57.8
Retired	32	35.5
Employed	6	6.7
Affected knee		
Right and left knee	60	66.7
Right knee	23	25.5
Left knee	7	7.8
Family history of osteoarthritis		
Yes	56	62.2
No	34	37.8
History of trauma to knees		
Yes	18	20.0
No	72	80.0
Use of walking assistive devices		
Yes	3	3.3
No	87	96.7

Bartlett's test, with results shown in Table 2. The results confirmed that the dataset was appropriate for EFA (KMO = 0.805; Bartlett's test = 529.073; $P < 0.001$). The EFA identified a three-factor structure, with eigenvalues above 1 obtained for the 12 items included in the analysis. The eigenvalue of factor 1 was 4.99 and explained 41.62% of the total variance; the eigenvalue of factor 2 was 1.86 and explained 15.51% of the total variance; the eigenvalue of factor 3 was 1.20 and explained 10.01% of the total variance. Together, these three factors accounted for 67.14% of the total variance. However, upon closer inspection, the contributions of the second and third factors to the total variance were significantly smaller than that of the first factor, the eigenvalue of which was notably higher. As a result, it was determined that the scale should be treated as having a single-factor structure. After deciding on a single-factor model, a reanalysis was conducted. The factor loadings of the items ranged from 0.43 to 0.82, indicating strong contributions to the overall scale. Consequently, no items were removed from the scale (Table 2).

Table 2 Principal factors of the knee osteoarthritis emotional meaning scale

Items		Factor loading
		Factor 1
Item 1	Unmotivated/Motivated	0.628
Item 2	Passive/Active	0.820
Item 3	Unimportant/Important	0.558
Item 4	Hopeless/Hopeful	0.513
Item 5	Difficult/Easy	0.438
Item 6	Irresponsible/Responsible	0.773
Item 7	Ineffective/Effective	0.744
Item 8	Weak/Strong	0.612
Item 9	Unsuccessful/Successful	0.741
Item 10	Coward/Brave	0.641
Item 11	Uncontrolled/Controlled	0.690
Item 12	Uninformed/Knowledgeable	0.449
Eigenvalue		4.99
Total variance accounted for		41.62
Kaiser–Meyer–Olkin measure of sampling adequacy		0.805
Bartlett's test of sphericity		529.073
P-value		<0.001

Reliability

To assess the contribution of individual items to the total scale score and their relationship with the overall scale, an item analysis was conducted. The results were summarised in Table 3. The item-total score correlation values ranged from 0.36 to 0.73, and the differences were statistically significant (Hotelling $T^2 = 431.796$; $P < 0.001$). The internal consistency of the scale was evaluated using the Cronbach's alpha coefficient, which was calculated to be 0.86, indicating a high level of reliability. Furthermore, no item showed an increase in Cronbach's alpha when removed from the scale, so all items were retained (Table 3).

The test–retest method was employed to evaluate the scale's stability over time, with results shown in Table 4. Data were collected again from 30 patients 2 weeks after the initial administration. The Pearson product–moment correlation was used to analyze the relationship between the first and second measurements, while the dependent samples *t*-test compared the mean scores. No statistically significant difference was found between the mean scores of the two tests ($P > 0.05$). Additionally, a strong, positive, and statistically significant correlation was observed between the two measurements ($r = 0.964$; $P < 0.001$), confirming the scale's time invariance.

Table 3 Item analysis and internal consistency of the knee osteoarthritis emotional meaning scale

No	Items	Mean ± SD	Corrected item-total correlation	Cronbach's alpha if item deleted
1	Unmotivated/Motivated	4.42 ± 1.16	0.515	0.86
2	Passive/Active	4.56 ± 0.94	0.737	0.84
3	Unimportant/Important	5.13 ± 1.09	0.441	0.86
4	Hopeless/Hopeful	4.00 ± 0.96	0.442	0.86
5	Difficult/Easy	3.04 ± 0.94	0.363	0.86
6	Irresponsible/Responsible	4.77 ± 0.85	0.696	0.84
7	Ineffective/Effective	4.81 ± 0.86	0.651	0.85
8	Weak/Strong	3.92 ± 0.97	0.527	0.85
9	Unsuccessful/Successful	4.48 ± 0.99	0.650	0.85
10	Coward/Brave	4.28 ± 0.87	0.563	0.85
11	Uncontrolled/Controlled	4.36 ± 0.98	0.614	0.85
12	Unmotivated/Motivated	3.57 ± 0.85	0.381	0.86
	Total scale score	51.33 ± 7.27		
	Total Cronbach's alpha	0.86		
	Hotelling T^2 test	431.796		

Table 4 Comparison of test–retest reliability of the scale and correlations

Practice time of the scale	Mean ± SD	t, p	r, p
First measurement	51.60 ± 6.89	0.189	0.964
Second measurement	51.67 ± 6.04	0.851	0.000

Note: t: the dependent samples t test value; p: statistical significance value; r: correlation value

DISCUSSION

Knee OA is a chronic, long-term disease with both physical and psychosocial consequences. Therefore, it is important to understand the experiences and emotional attitudes of patients with this diagnosis in coping with the disease and determining the care and treatment program, ensuring their compliance with treatment.[8,25,26] In this study, the KOEMS was developed to assess the emotional attitudes of patients diagnosed with knee OA in coping with the disease and its psychometric properties were examined.

The structural validity of the scale was assessed through factor analysis. Factor analysis groups scaled items based on shared characteristics and transformed them into a standardised format.[30] To confirm suitability, the KMO coefficient and Bartlett's test were calculated. The results (KMO = 0.80; Bartlett's test = 529.07; $P < 0.001$) indicated that the data were appropriate for factor analysis.[39]

EFA is performed to determine how many subheadings the items in a drafted and implemented scale will be grouped under and to determine what kind of relationship there is between them.[37] In factor analysis, it is considered sufficient for the variance rate explained by the factors in the scale to be between 40% and 60%, and a high explained variance rate indicates that the factor structure of the developed scale is strong.[42] EFA revealed a single-factor structure that explained 41.62% of the total variance. Item loadings ranged from 0.43 to 0.82, exceeding the acceptable threshold of 0.30.[40,43] No items were removed based on these results.

Item analysis tested the reliability of the scale by calculating item-total score correlations, which ranged from 0.36 to 0.73, exceeding the minimum acceptable threshold of 0.25.[30,41] Hotelling's T^2 test confirmed that the items were perceived consistently by patients ($P < 0.001$), demonstrating that the scale effectively measures the emotional attitudes of individuals with knee OA.

The scale's internal consistency was assessed using Cronbach's alpha, which was calculated as 0.86, indicating high reliability.[32] Additionally, the test–retest analysis confirmed that the scale provided stable results over time, with a strong positive correlation ($r = 0.964$; $P < 0.001$) and no significant differences between mean scores obtained 2 weeks apart.

Limitations

This study was conducted in a single hospital unit in Turkey, limiting the generalisability of the findings due to the small sample size. While the KOEMS was considered easy to use in this study, further research is recommended to validate its applicability across broader populations.

CONCLUSION

The statistical analyses performed in this study demonstrated that the KOEMS is a valid and reliable tool

for measuring the emotional attitudes of patients with knee OA. By identifying patients' emotional attitudes, the scale can provide valuable insights for healthcare professionals in designing tailored care and treatment programs, ultimately enhancing treatment adherence.

AUTHOR CONTRIBUTIONS

Conceptualisation, study design, data analysis and interpretation: NP, AA. Statistical analysis, data acquisition and supervision: AA. Each author made important intellectual contributions during manuscript drafting or revision and is accountable for the overall work, ensuring that questions pertaining to the accuracy and integrity of any portion of the work are appropriately investigated and resolved.

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DISCLOSURE

None of the authors have a conflict of interest to disclose.

ETHICS STATEMENT

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Pamukkale University Medical Ethics Committee (IRB number: E-60116787-020-610 205, date: 12.11.2024).

DATA AVAILABILITY STATEMENT

Research data are not shared.

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