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Examining the Relationships and Differences of Satisfaction, Kinesiophobia, and Pain Between Rehabilitation Phases in Patients After Total Knee Replacement

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Abstract

Background/objectives: Total knee arthroplasty is one of the most commonly performed orthopedic procedures of the lower extremities, primarily for patients with osteoarthritis or rheumatoid arthritis. Despite its widespread use, evidence remains limited regarding the association between patient satisfaction, kinesiophobia, and pain during the early post-operative period. The purpose of the present study was to examine the relationships and differences among satisfaction, kinesiophobia, and pain in hospitalized patients following total knee arthroplasty, as well as to compare these variables across four postoperative time points. Methods: A total of 41 patients, aged 65–85 years, participated in this study. Patient satisfaction was assessed using a structured satisfaction questionnaire, kinesiophobia was assessed using the Greek version of Tampa Scale of Kinesiophobia, and pain was assessed using the Visual Analogue Scale. Measurements were obtained on the first postoperative day, on the day of hospital discharge, fifteen days after discharge, and four weeks after discharge. Normality was assessed using the Shapiro–Wilk test, indicating non-normally distributed data. The relationship between the variables were examined using Spearman's correlation coefficient. Comparisons between the four postoperative time points were conducted using the Friedman test with Kendall's W for effect size estimation, followed by Wilcoxon post hoc analyses with Bonferroni corrections. Results: The results showed that a significant negative correlation between satisfaction and kinesiophobia was observed at the fourth phase ($r = -0.41$, $p = 0.04$). Satisfaction was also negatively correlated with pain from the third to the fourth phase ($r = -0.41$, $p = 0.008$), whereas kinesiophobia demonstrated a significant positive correlation with pain from the second to the fourth phase ($r = 0.47$–0.56, $p = 0.002$). Friedman test comparisons revealed a significant increase in satisfaction over time (χ^2 (3) = 13.88, $p = 0.003$), a significant progressive decrease in kinesiophobia with a moderate effect size (χ^2 (3) = 76.40, $p < 0.001$; Kendall's W = 0.62), and a significant progressive reduction in pain with a large effect size (χ^2 (3) = 89.60, $p < 0.001$; Kendall's W = 0.73). Conclusions: These findings indicate that satisfaction, kinesiophobia, and pain are significantly interrelated during the early postoperative period following total knee arthroplasty. Further studies with larger samples and longer follow-up periods are required to confirm these associations and support the development of targeted rehabilitation strategies.

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1. Introduction

Patient satisfaction constitutes a multidimensional and highly important indicator of healthcare quality, particularly in postoperative rehabilitation following orthopedic surgery. The concept of satisfaction is influenced by the type of treatment, the care environment, and patients' expectations, and can be distinguished into satisfaction with treatment outcomes and satisfaction with the care process. The latter is often associated with increased levels of dissatisfaction related to factors such as cost, inconvenience, or limited access to healthcare services [1]. Additionally, healthcare professionals' behavior and communication, as well as patients' active involvement in decision-making, play a crucial role in shaping perceived quality of care and overall satisfaction [2]. Differences between patient experience and patient satisfaction have also been described, with experience referring to what actually occurred during care delivery, whereas satisfaction reflects whether patients' expectations were fulfilled [3]. High levels of patient satisfaction have been associated with greater adherence to therapeutic recommendations, increased engagement in the rehabilitation process, and improved clinical outcomes [4]. On the contrary, low satisfaction levels may negatively affect continuity of care and long-term recovery [4].

Knee osteoarthritis is a progressive, incurable degenerative joint disease caused by the wear and tear of cartilage, leading to pain, stiffness, and reduced mobility, whereas knee rheumatoid arthritis is a chronic autoimmune disease-causing inflammation, which causes stiff, warm, and swollen knees, with symptoms often felt symmetrically. Both of them are commonly managed through physiotherapy exercise and surgical options, like knee replacement for advanced, severe cases. High-level evidence synthesizing multiple systematic reviews indicates that non-pharmacological interventions, including exercise, improve pain, quality of life, and function in knee osteoarthritis [5]. Similarly, an umbrella review with meta-meta-analysis [6] found moderate evidence supporting exercise for pain reduction and functional improvement.

Total knee arthroplasty (TKA) is considered one of the most effective surgical interventions for the management of end-stage osteoarthritis and rheumatoid arthritis, aiming primarily to reduce pain, improve function, and restore joint mobility [7]. Particularly following TKA, patient satisfaction is influenced by several factors, including postoperative pain, joint range of motion, functional performance, and quality of life [8,9]. Sociodemographic and psychological characteristics, such as age, sex, comorbidities, anxiety, depression, and preoperative expectations, have also been shown to affect satisfaction levels [10]. Although the majority of patients report high satisfaction rates following TKA, a substantial proportion (15–20%) remains dissatisfied, mainly due to persistent pain, stiffness, or limited functional recovery [11]. These findings indicate that surgical success is not determined solely by technical or procedural factors; it is also influenced by psychological and behavioral variables that affect patients' perceptions of recovery.

One such variable is kinesiophobia, defined as an excessive and irrational fear of movement or physical activity resulting from the expectation of pain or re-injury [12]. Kinesiophobia has been associated with increased pain levels, reduced functional capacity, restricted joint range of motion, and lower quality of life in patients following total knee arthroplasty [13]. Moreover, postoperative pain and low self-efficacy have been identified as key contributors to the development of kinesiophobia, leading to movement avoidance and delayed rehabilitation progress [14]. Patients presenting higher levels of kinesiophobia may demonstrate reduced active knee flexion, decreased muscle strength, and

difficulty performing daily functional activities, ultimately compromising rehabilitation outcomes [13].

Despite evidence supporting the independent association of patient satisfaction with pain and functional outcomes, as well as the negative impact of kinesiophobia on postoperative recovery, there is currently limited research examining the relationship between patient satisfaction, kinesiophobia, and pain in hospitalized patients following TKA. Most aforementioned existing studies have investigated these variables separately or have focused primarily on long-term postoperative outcomes, without simultaneously exploring their interaction during the acute in-hospital phase of recovery [8–10,13,14].

Importantly, there is a lack of longitudinal data assessing how patient satisfaction, kinesiophobia, and postoperative pain evolve across different recovery phases, from the immediate postoperative period to hospital discharge and the early post-discharge phase. The transition from acute hospitalization to home-based recovery may be affected by the pain perception, fear of movement, and perceived quality of care.

Therefore, the present study was designed to address this gap by simultaneously examining the relationships between patient satisfaction, kinesiophobia, and postoperative pain in hospitalized patients following TKA. In addition, this study aimed to investigate potential differences in these variables across four specific postoperative time points: (a) the first postoperative day, (b) the day of hospital discharge, (c) the 15th postoperative day, and (d) four weeks after discharge. By exploring both cross-sectional associations and temporal changes, the present study seeks to provide a more comprehensive understanding of early recovery dynamics and to identify psychological and behavioral factors that may influence rehabilitation progress. Understanding this relationship may contribute to the development of more targeted rehabilitation strategies, improved patient-centered care approaches, and early identification of patients at risk for suboptimal recovery trajectories following TKA.

Therefore, the aim of the current study was to investigate the relationship between patient satisfaction, kinesiophobia, and pain and the differences in these variables across four consecutive postoperative time points: (a) the first postoperative day, (b) the day of hospital discharge, (c) the fifteenth postoperative day, and (d) four weeks following discharge. in patients undergoing TKA. The research hypotheses of this study were as follows: (a) the satisfaction is correlated negatively with kinesiophobia; (b) the satisfaction is correlated negatively with the pain; (c) the kinesiophobia is correlated positively with the pain; and (d) there are statistical differences in satisfaction, kinesiophobia, and pain between the four postoperative time points.

2. Materials and Methods

This study was conducted in accordance with the Declaration of Helsinki. This study was approved by (a) the Ethics Committee of the University of the Peloponnese (protocol number 11894/15-05-2025), (b) the Scientific Committee of General Hospital of Athens "G.Gennimatas" (protocol number 3284/10-10-2025), and (c) the Scientific Committee of University General Hospital "Attikon" (protocol number 605/10-09-2025). Participants were given a consent form and a demographic data form in which their personal data were recorded. Before they completed the questionnaires, they were informed that they had a right to refuse to participate or withdraw at any time from this study. There were no risks of accident or serious harm to the participants in this study.

2.1. Participants

A priori power analysis was conducted using G*Power version 3.1.9.7 to determine the required sample size for both the repeated measures comparisons and the correlation analyses. The effect size was estimated with a significance level of $\alpha = 0.05$ and an 80%

power, indicating a sample size of 24 participants [15,16]. Forty-one participants (33 women and 8 men) aged 65 to 85 years old, with an average age of 70.66 ± 5.6 years old, were recruited from the inpatient Orthopedic Clinics General Hospital of Athens G. Gennimatas and University Hospital of Athens Attikon from May to November 2025.

All participants received the same standardized postoperative physiotherapy program by the hospital physiotherapist only in the morning shift 5 days a week for 30 min, starting on the first postoperative day and continuing until hospital discharge. The protocol included in-bed exercises such as ankle pumping exercises (dorsiflexion and plantarflexion), isometric quadriceps contractions, active-assisted hip abduction and adduction, assisted knee flexion within pain limits, and straight-leg raises on the operated side. Subsequently, with the assistance of physiotherapist, patients were brought to a seated position, where they performed active knee extension within pain limits, aiming to achieve full knee extension. From the seated position, using a walker and physiotherapist support, patients stood upright, bearing almost full weight on the operated lower limb. They then performed hip flexion exercises with the knee fully extended and ankle dorsiflexion, heel lifts from the floor and finally ambulation with the walker.

The inclusion criteria of the sample were as follows: (a) aged 65 to 85 years old, (b) men and women, (c) diagnosed with osteoarthritis or rheumatoid arthritis, (d) good verbal and written communication and ability to follow instructions, (e) surgically treated with total knee arthroplasty, and (f) participation in postoperative physiotherapy treatment during hospital stay. The exclusion criteria were as follows: (a) undergone unicompartmental knee arthroplasty; (b) revision total knee arthroplasty; (c) severe comorbidities, such as stroke, chronic respiratory diseases, and severe cardiac conditions; (d) diagnosed with other forms of arthritis, such as psoriatic arthritis or crystal-induced arthritis; and (e) diagnosed with dementia, anxiety, depression, or other phycological disorders.

2.2. Instruments

2.2.1. Tampa Scale of Kinesiophobia (TSK) [17]

The Tampa Scale of Kinesiophobia is used for assessing a patient's perceived fear related to movement of the affected limb following injury or surgery, as well as the perceived risk of re-injury or falling after exercise. The scale consists of 17 items, with each item scored on a 4-point Likert scale ranging from 1 (no fear) to 4 (high fear), yielding a total score between 17 and 68. Scores of 37 or lower are more likely to indicate low levels of fear of movement, whereas scores of 37 or higher indicate high levels of fear of movement. Satisfactory internal consistency (Chronbach's $\alpha = 0.74$) and acceptable test–retest reliability (ICC = 0.78) have been reported in patients with non-specific low back pain [18]. However, evidence regarding the reliability and validity of the TSK in patients following total knee arthroplasty remains limited. The Tampa Scale of Kinesiophobia has been cross-culturally validated in the Greek population by Georgoudis et al. [18].

2.2.2. Visual Analogue Scale for Pain (VAS-P) [19]

The Visual Analogue Scale for Pain was used to assess pain intensity [20]. It consists of a 10 cm horizontal line anchored at 0, indicating no pain, and 10, indicating worst imaginable pain. The VAS-P is widely used to quantify subjective pain intensity, including in the context of joint arthroplasty, where it has been shown to be sensitive to changes in postoperative pain levels following total joint replacement procedures. Clinically meaningful changes in VAS-P scores have been defined in arthroplasty populations, supporting its use as a responsive outcome measure evaluating postoperative pain progression and intervention effects [16]. Minimal clinically important differences have been reported for both total hip and total knee arthroplasty populations, emphasizing its utility for detecting

meaningful pain improvement or worsening over time [20]. The VAS-P has demonstrated good reliability with ICC, ranging from 0.95 to 0.98 [21].

2.2.3. Patient Satisfaction Questionnaire

A Patient Satisfaction Questionnaire was developed for the purposes of the present study based on the existing bibliography. It consists of 30 items covering multiple domains, including the hospital and its organizational structure (e.g., organization during admission, length of hospital stay, and room facilities); the healthcare staff (physicians, nursing staff, and physiotherapists); and the provision of in-hospital services, as well as patients' satisfaction with the surgical outcome and postoperative pain management following total knee arthroplasty.

More specifically, the questionnaire includes items assessing satisfaction with medical communication and information provision (e.g., "the physician's answers regarding your medical condition" and "medical instructions provided after surgery"), overall medical and nursing care, and the quality and content of physiotherapy services (e.g., "the guidance and instructions provided for physiotherapy," "the way physiotherapy was conducted," "the duration of physiotherapy sessions," and "the outcome of physiotherapy rehabilitation"). In addition, organizational and environmental aspects of hospitalization are evaluated (e.g., "organization during admission to the Orthopaedic Clinic," "room facilities," and "length of hospital stay"), along with satisfaction with the results of total knee arthroplasty and pain relief achieved after surgery (e.g., "results of total knee arthroplasty," "pain relief following surgery," and "management of postoperative pain").

Each item was structured in two distinct parts. In the first part, patients were asked to indicate whether they were satisfied with the respective aspect of care by selecting one of two response options ("yes" and "no"). Conditional upon a positive response ("yes"), patients were subsequently asked, in the second part, to quantify the degree of their satisfaction using a 10-point visual analogue scale ranging from 0 (not at all satisfied) to 10 (extremely satisfied). This two-step structure allowed for both the identification of satisfaction presence and the measurement of its intensity, providing a more detailed evaluation of patients' perceptions regarding their hospitalization and postoperative rehabilitation experience.

2.3. Procedure

This experimental study was conducted in a hospital setting by a single physiotherapist. All participants were informed about the purpose, significance, and procedures of this study prior to enrolment and written informed consent was obtained. Following patients' agreement to participate, assessment procedures were carried out, and the questionnaires were administered. The initial assessment was subjective and included the collection of demographic data (sex, age, marital status, and children); date of and reason for hospital admission; date of surgery; diagnosis of osteoarthritis or rheumatoid arthritis; and, if applicable, the time of diagnosis, the affected joint and the symptoms that led to medical consultation, as well as their onset. Patients were also asked about any previous hospitalizations or surgeries; the presence of comorbid conditions; and, if applicable, the pharmacological treatment for those conditions, as well as the use of oxygen and its type. In addition, information regarding preoperative ambulation status was collected, including whether patients ambulated independently or required assistive devices and whether ambulation was limited to indoor or extended to outdoor environment.

Patients were administered the three questionnaires by the 2nd author: (a) the Patient Satisfaction Questionnaire, (b) the TSK questionnaire assessing kinesiophobia, and (c) the VAS-P questionnaire assessing pain. The questionnaires were self-administered by the

patients, with explanations provided by the 2nd author when necessary. The order of questionnaire administration was standardized and identical for all participants, with the satisfaction questionnaire administered first, followed by the TSK questionnaire and, finally, the VAS-P questionnaire. This fixed order was maintained consistently across all four assessment time points. All outcome measures—satisfaction, kinesiophobia and pain—were assessed at four time points: (a) on the first postoperative day, (b) on the day of hospital discharge, (c) fifteen days after discharge, and (d) four weeks after discharge. At each assessment time point, the questionnaires were administered once, and the overall procedure lasted about 20 min. All of the participants followed the same physiotherapy program in their homes by the same hospitalized physiotherapist. The program included assisted passive stretching of the operated limb for 5 s, performed 20–30 times per session to promote full range of motion. Assisted flexion and extension exercises were also prescribed, with 20–30 repetitions performed twice daily. Quadriceps strengthening was carried out through straight-leg raises without support, as well as resistance exercises using the non-operated limb, with 2–3 sets of 20–30 repetitions. Functional exercises, including sit-to-stand transfers and stair climbing, were incorporated to enhance daily mobility and overall functional independence [22].

2.4. Statistical Analysis

Descriptive statistics, including mean and standard deviations, were calculated. A normality test of the distribution of all variables was performed using the Shapiro–Wilk test (sample size < 50). The results of the normality testing indicated that the data were not normally distributed; therefore, non-parametric statistical tests were applied.

Comparisons across the four postoperative time points were analyzed using the Friedman test. Kendall's W was calculated to estimate the effect size. Post hoc pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni correction. Additionally, correlation between satisfaction, kinesiophobia, and pain were examined at each of the four postoperative time points using Spearman's rank correlation coefficient. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS 29.00) with a statistical significance level of $\alpha = 0.05$.

3. Results

Demographic and Clinical Characteristics

Table 1 shows the descriptives on participants' demographic and clinical characteristics. On the Table 2, there are descriptive statistics of the (a) 1st post-surgical day, (b) the hospital discharge day, (c) the 15th day of discharge day and (d) on the 4th post-surgical weeks from the discharge day. The Table 3 showed the frequencies of the demographical data of the sample.

Table 1. Descriptive statistics of the demographical data.

Demographic Characteristics	M (SD)	Minimum Value	Maximum Value	Kurtosis	Skewness
Age (years)	70.66 (5.6)	85	65	0.5	1.1
Years since diagnosis OA [1] or RA [2]	7.8 (5.4)	30	1	6.1	1.7
Years of symptoms	7.9 (5.5)	30	1	5.2	1.5

M, mean; SD, standard deviation. [1] Osteoarthritis. [2] Rheumatoid arthritis.

Table 2. Descriptive statistics of the four postoperative time points.

Days	Range	M (SD)	Maximum Value	Minimum Value	Kurtosis	Skewness
Admission–Discharge	7	1.6 (1.3)	7	0	6.8	1.9
Phase 1 [1]	-	-	-	-		
Phase 2 [2]	6	3.90 (1.5)	8	2	1.6	1.4
Phase 3 [3]	6	18.0 (1.5)	22	16	1.7	1.4
Phase 4 [4]	6	32.0 (1.5)	36	30	1.0	1.3

[1] 1st post-surgical day, [2] hospital discharge day, [3] 15th day of discharge day, and [4] 4th post-surgical weeks from the discharge day.

Table 3. Frequencies of the demographical data.

Characteristics	Answers	Frequency	Percentage
Sex	Men	8	19.5%
	Women	33	80.5%
Marital status	Married	34	82.9%
	Widowed	5	12.2%
	Divorced	2	4.9%
Educational level	Primary school	18	43.9%
	Secondary school	8	19.5%
	High school	9	22.0%
	University	6	14.6%
Children	Yes	40	97.6%
	No	1	2.4%
Number of children	1	6	14.6%
	2	20	48.8%
	3	9	22.0%
	4	2	4.9%
	5	3	7.3%
Reason for admission	TKA L	22	53.7%
	TKA R	19	46.3%
Diagnosis	Osteoarthritis	38	92.7%
	Rheumatoid arthritis	3	7.3%
Type of surgery	TKA L	22	53.7%
	TKA R	19	46.3%
	Knee	41	100%
Communication level	Excellent	41	100%
Symptoms	Pain, stiffness, edema	5	12.2%
	Pain, edema, crepitus	8	19.5%
	Pain, stiffness, edema, crepitus	28	68.3%
Oxygen therapy	Yes	11	26.8%
	No	30	73.2%
If yes, what type	C-PAP	2	4.8%
	Nasal cannula	9	22.0%
Previous surgeries	Yes	30	73.2%
	No	11	26.8%
If yes, why	Gynecological	2	4.9%
	Heart	2	4.9%
	Orthopedic	5	12.2%
	Abdominal	6	14.6%
	Lower limb	8	19.5%
	Gynecological, abdominal	2	4.9%
	Orthopedic, abdominal	3	7.3%
Indoor ambulation only	Yes	7	17.1%
	No	34	82.9%
How	Nothing	29	70.8%
	Cane	8	19.5%
	Cane constantly	3	7.3%
	Walker	1	2.4%

Spearman r correlations showed that kinesiophobia is positively correlated with pain from Phase 2 to 4. Satisfaction also has a statistically significant negative correlation with pain in Phases 3 and 4. Finally, in Phase 4, satisfaction is negatively correlated with kinesiophobia, indicating more complete clinical improvement (Table 4).

Table 4. Correlations in satisfaction intensity, kinesiophobia, and pain.

	Variables	Satisfaction Intensity	Kinesiophobia	Pain
Phase 1 [1]	Satisfaction intensity	1.00	−0.12 (p = 0.45)	−0.22 (p = 0.17)
	Kinesiophobia	−0.12 (p = 0.45)	1.00	0.27 (p = 0.09)
	Pain	−0.22 (p = 0.17)	0.27 (p = 0.09)	1.00
Phase 2 [2]	Satisfaction intensity	1.00	−0.11 (p = 0.49)	−0.15 (p = 0.35)
	Kinesiophobia	−0.11 (p = 0.49)	1.00	0.56 (p < 0.001)
	Pain	−0.15 (p = 0.35)	0.56 (p < 0.001)	1.00
Phase 3 [3]	Satisfaction intensity	1.00	−0.26 (p = 0.10)	−0.41 (p = 0.008)
	Kinesiophobia	−0.26 (p = 0.10)	1.00	0.56 (p < 0.001)
	Pain	−0.41 (p = 0.008)	0.56 (p < 0.001)	1.00
Phase 4 [4]	Satisfaction intensity	1.00	−0.32 (p = 0.04)	−0.41 (p = 0.007)
	Kinesiophobia	−0.32 (p = 0.04)	1.00	0.47 (p = 0.0002)
	Pain	−0.41 (p = 0.007)	0.47 (p = 0.002)	1.00

[1] 1st post-surgical day, [2] hospital discharge day, [3] 15th day of discharge day, and [4] 4th post-surgical weeks from the discharge day.

Descriptive statistics of this study's variables, (a) kinesiophobia and (b) pain, in the four phases are presented in Table 5. To calculate the Tampa Scale scores, reverse scoring was applied to questions 4, 8, 12, and 16 (1↔4, 2↔3). The total score was obtained by summing questions 1–17.

Table 5. Descriptive statistics in kinesiophobia and pain in four postoperative phases.

Variables	Phase	M (SD)	Range	Maximum Value	Minimum Value	Kurtosis	Skewness
Kinesiophobia	1st	34.61 (5.45)	24–48	48	24	−0.03	0.40
	2nd	33.56 (5.94)	22–47	47	22	−0.35	0.09
	3rd	30.98 (5.09)	22–46	46	22	0.58	0.31
	4th	29.54 (5.48)	22–46	46	22	2.11	1.21
Pain	1st	5.49 (2.60)	0–10	10	0	−0.49	−0.25
	2nd	5.05 (2.41)	0–9	9	0	−0.56	−0.25
	3rd	3.56 (2.04)	0–7	7	0	−0.97	0.00
	4th	2.32 (1.93)	0–7	7	0	−0.58	0.62

1st phase: post-surgical day, 2nd phase: hospital discharge day, 3rd phase: 15th day of discharge day, and 4th phase: post-surgical weeks from the discharge day.

Table 6 shows an increase in both the number of positive responses to satisfaction and the intensity of satisfaction compared from Phase 1 to Phase 4. In particular, the average number of positive responses increased from 5.4 (SD = 2.3) in Phase 1 to 7.8 (SD = 2.6) in Phase 2, 10.9 (SD = 2.4) in Phase 3, and 12.6 (SD = 2.3) in Phase 4. Also, the average intensity of satisfaction increased from 3.1 (SD = 0.7) in Phase 1 to 6.3 (SD =1.0) in Phase 4. The intensity of satisfaction was presented descriptively through percentages of positive responses per time phase.

Table 6. Descriptive statistic of the satisfaction scale in the 4 phases.

Phase	Positive Answers (0–15) M (SD)	Satisfaction Intensity (0–10) M (SD)
1st	5.4 (2.3)	3.1 (0.7)
2nd	7.8 (2.6)	4.0 (0.8)
3rd	10.9 (2.4)	5.2 (0.9)
4rth	12.6 (2.1)	6.3 (1.0)

1st phase: post-surgical day, 2nd phase: hospital discharge day, 3rd phase: 15th day of discharge day, and 4th phase: post-surgical weeks from the discharge day.

The χ^2 test did not show statistically significant differences in the frequency of positive responses in the satisfaction scale between the four time phases (χ^2 = 1.10; df 3, p = 0.78). The intensity of satisfaction was tested by time phase with the Freidman test and Kendall effect size test, t. A statistically significant increase in the intensity of satisfaction is observed

over time, with a small-to-moderate effect size. (Table 7). Post hoc Wilcoxon comparisons were also performed for the intensity of satisfaction with Bonferroni correction. After applying the Bonferroni correction, none of the two-tailed comparisons remained statistically significant despite the overall statistically significant result of the Friedman test (Table 8).

Table 7. Descriptives and comparisons in satisfaction intensity, kinesiophobia, and pain between phases.

Variable	Mean Rank Phase 1	M(SD)	Mean Rank Phase 2	M(SD)	Mean Rank Phase 3	M(SD)	Mean Rank Phase 4	M(SD)	Friedman $\chi^2(3)$	P	Kendall's W
Satisfaction intensity	1.72	3.1 (0.7)	2.28	4.0 (0.8)	2.78	5.2 (0.9)	3.22	6.3 (0.1)	13.88	0.003	0.11
Kinesiophobia	4.00	41.8 (6.4)	3.05	36.2 (6.1)	1.95	30.7 (5.8)	1.00	27.9 (5.5)	76.4	<0.001	0.73
Pain	4.00	6.73 (1.42)	3.06	5.21 (1.36)	1.94	3.48 (1.29)	1.00	2.19 (1.11)	89.6	<0.001	0.62

Phase 1: 1st post-surgical day, Phase 2: hospital discharge day, Phase 3: 15th day of discharge day, and Phase 4: 4th post-surgical weeks from the discharge day.

Table 8. Post hoc Wilcoxon comparisons about satisfaction intensity, kinesiophobia, and pain with Bonferroni correction.

Variables	Comparisons	Wilcoxon Z	Bonferroni Correction
Satisfaction intensity	Phase 1–Phase 2	0.32	1.00
	Phase 1–Phase 3	0.65	1.00
	Phase 1–Phase 4	1.19	1.00
	Phase 2–Phase 3	0.92	1.00
	Phase 2–Phase 4	1.58	0.69
	Phase 3–Phase 4	2.52	0.07
Kinesiophobia	Phase 1–Phase 2	−4.91	<0.001
	Phase 1–Phase 3	−5.62	<0.001
	Phase 1–Phase 4	−5.84	<0.001
	Phase 2–Phase 3	−4.76	<0.001
	Phase 2–Phase 4	−5.18	<0.001
	Phase 3–Phase 4	−3.64	0.002
Pain	Phase 1–Phase 2	−5.12	<0.001
	Phase 1–Phase 3	−5.78	<0.001
	Phase 1–Phase 4	−5.96	<0.001
	Phase 2–Phase 3	−4.87	<0.001
	Phase 2–Phase 4	−5.41	<0.001
	Phase 3–Phase 4	−3.92	0.001

Phase 1: 1st post-surgical day, Phase 2: hospital discharge day, Phase 3: 15th day of discharge day, and Phase 4: 4th post-surgical weeks from the discharge day.

The total score of the kinesiophobia questionnaire showed a trend across the four postoperative time phases. Specifically, the mean value decreased from 41.8 (SD = 6.4) in Phase 1 to 36.2 (SD = 6.1) in Phase 2, 30.7 (SD = 5.8) in Phase 3, and 27.9 (SD = 5.5) in Phase 4. The Friedman test showed a statistically significant difference across time phases, $\chi^2(3) = 76.4$, $p < 0.001$, with a large effect size (Kendall's W = 0.62; Tabel 7). Post hoc comparisons with the Wilcoxon test and Bonferroni correction showed that all time phases differed statistically significantly from each other ($p < 0.001$), confirming the gradual reduction in fear of movement (Table 8)

The mean pain value showed a decrease from Phase 1 (M = 6.73; SD = 1.42) to Phase 2 (M = 5.21; SD = 1.36), to Phase 3 (M = 3.48; SD = 1.29), and to Phase 4 (M = 2.19; SD = 1.11). The non-parametric Friedman analysis revealed a statistically significant difference between the four postoperative time phases, $\chi^2(3) = 89.6$, $p < 0.001$, with a large effect size (Kendall's W = 0.73; Table 7). Post hoc comparisons using the Wilcoxon test and Bonferroni correction

showed that all two-tailed comparisons between time points were statistically significant ($p \leq 0.001$; Table 8). These results suggest a significant reduction in pain during the four postoperative four phases.

4. Discussion

4.1. Correlations of the Variables by Phase

The present study aimed to examine the relationships among three variables—patient satisfaction, kinesiophobia, and pain—in hospitalized patients following TKA. Our findings revealed no significant correlation among satisfaction, kinesiophobia, and pain on the first postoperative day. However, by discharge, a significant negative correlation emerged between kinesiophobia and pain. At fifteen days post-discharge, satisfaction and kinesiophobia remained non-significantly correlated, while significant negative correlations between satisfaction and pain, and significant positive correlations between kinesiophobia and pain were observed. By four weeks post-discharge, all three variables showed significant correlations: satisfaction was negatively correlated with both kinesiophobia and pain, while kinesiophobia and pain were positively correlated. These results support the initial hypotheses regarding the relationships among the variables.

The lack of significant associations on the first postoperative day aligns with prior findings in similar surgical populations [23] where early postoperative kinesiophobia and pain relationships are minimal, possibly due to the dominance of biological factors over cognitive and behavioral mechanisms in acute pain perception. At this immediate postoperative stage, pain is primarily driven by acute surgical tissue trauma, inflammatory response, and peripheral nociceptor sensitization, which may overshadow psychological and cognitive components of fear. Similarly, no significant correlation was found between satisfaction and pain immediately post-surgery, likely showing the multifactorial nature of patient satisfaction, which extends beyond pain intensity alone [24]. Patient satisfaction in the early postoperative period is strongly influenced by perceived quality of care, communication with healthcare professionals, and overall management rather than by absolute pain levels. Therefore, during the first 24 h after surgery, satisfaction may reflect the care environment rather than the subjective experience of pain [25].

Conversely, the positive association between kinesiophobia and pain by discharge supports evidence that fear of movement can exacerbate pain perception and negatively impact recovery [15,26]. At this stage, patients begin active mobilization, and movement becomes directly linked to pain experience. Kinesiophobia measured around the fifth postoperative day was positively associated with pain intensity, indicating that fear of movement may amplify pain perception during functional activity [15]. Furthermore, multidimensional pain burden and preoperative chronic pain intensity are identified as significant predictors of early postoperative kinesiophobia, suggesting that previous pain experiences may shape patients' movement-related beliefs after surgery [27]. Sociodemographic factors such as age, sex, and education level appeared to have limited influence on these associations [27,28]. Although lower educational level, reduced self-efficacy, and limited social support contribute to the development of kinesiophobia, the early postoperative association between pain and kinesiophobia appears primarily driven by pain intensity itself, reinforcing the central role of pain perception in this relationship [28].

At the intermediate stage (fifteen days post-discharge), significant negative correlations between satisfaction and pain were consistent with previous research [29], emphasizing effective pain management's critical role in enhancing patient satisfaction during recovery. During this transitional phase between acute and subacute recovery, patients increasingly evaluate surgical success based on symptom relief and functional improvement. Lower postoperative pain levels are associated with higher satisfaction, particularly

when multimodal analgesia and effective pain control strategies are implemented [29]. The reduction in pain likely facilitates participation in physiotherapy, improvement in knee range of motion, and better general health status, all of which contribute to enhanced satisfaction. The continued positive correlation between kinesiophobia and pain suggests that addressing fear of movement remains essential during this phase. Persistent pain may reinforce avoidance behaviors and reduce confidence in the operated limb, maintaining the association between perceived pain intensity and fear of reinjury, as also supported by findings in patients with musculoskeletal pain [26].

Finally, at four weeks post-discharge, the observed pattern of correlations reinforces the interconnected nature of these variables throughout the recovery trajectory. At this stage, pain levels have typically decreased substantially, and functional expectations become more prominent. Patients who continue to experience higher pain may perceive recovery as less successful, which may reduce overall satisfaction. Simultaneously, improved pain control and functional gains may enhance confidence in movement and decrease kinesiophobia, explaining the significant negative relationship between satisfaction and kinesiophobia observed in this phase. Notably, the persistent negative relationship between satisfaction and kinesiophobia represents a novel contribution, as existing studies have not evaluated these variables concurrently at this time point post-TKA.

4.2. Comparisons of the Variables Across Phase

Comparative analyses of satisfaction, kinesiophobia, and pain across the four postoperative phases demonstrated significant changes in all variables. Patient satisfaction steadily increased from the first postoperative day to four weeks after discharge, reflecting progressive improvement in perceived care and functional recovery [30,31]. These trends corroborate prior longitudinal studies reporting gradual enhancement of satisfaction over extended postoperative periods [32,33]. Early dissatisfaction does not necessarily predict final outcomes, since satisfaction evolves over time in parallel with pain reduction and functional improvement. The progressive restoration of mobility, better knee function, and effective pain control appear to be the primary mechanisms underlying this steady increase in patient satisfaction [30,31].

Kinesiophobia exhibited a significant and progressive decline throughout the recovery, with the highest levels immediately post-surgery, attributable to acute pain, uncertainty, and fear of movement. This reduction aligns with previous findings indicating that early mobilization and rehabilitation effectively diminish movement-related fear [34,35]. Kinesiophobia elevated immediately after surgery due to intense pain and uncertainty regarding joint safety. The subsequent reduction may be attributed to improved pain control, increased confidence in the operated limb, and structured physiotherapy programs that gradually reintroduce movement. Similarly observed significant decreases in kinesiophobia two and four weeks postoperatively were noted by researchers, who associated this decline with improved range of motion and functional reintegration into daily activities.

Pain intensity showed a consistent decrease over time, mirroring the typical physiological recovery process and successful implementation of pain management protocols combining pharmacological and non-pharmacological strategies [36,37]. The highest pain scores immediately postoperative gradually subsided as inflammation resolved and functional mobility improved, supporting the efficacy of multidisciplinary postoperative care. As described, the elevated pain levels observed on the first postoperative day are mainly attributable to acute surgical tissue injury and inflammatory processes leading to nociceptor sensitization [37]. The progressive reduction in pain during subsequent phases reflects the resolution of inflammation; effective multimodal analgesia; and the beneficial

effects of early mobilization and physiotherapy in reducing edema, stiffness, and muscle guarding [36].

4.3. Limitations and Recommendations for Future Research

Several limitations should be acknowledged. The relatively small convenience sample of 41 patients aged 65 to 85 undergoing primary TKA limits generalizability, particularly to younger populations and other orthopedic procedures. The short follow-up period of four weeks restricts insights into longer-term recovery dynamics, especially considering that both pain and kinesiophobia may continue evolving beyond this timeframe [38,39]. Furthermore, the gender imbalance and absence of subgroup analyses limit our understanding of sex-specific influences. The sample's advanced average age also constrains extrapolation to younger cohorts with potentially different psychosocial profiles and rehabilitation trajectories.

Future studies should aim for larger, more diverse samples including younger patients (< 65 years) to enhance representativeness. Balanced gender inclusion would enable investigation of sex differences in satisfaction, kinesiophobia, and pain relationships. Longitudinal designs extending follow-up to at least five years post-TKA would provide valuable data on the durability of early postoperative findings and long-term patient outcomes. Investigating revision TKA cases separately could elucidate distinct patterns related to prior surgical experience. Further research focusing on the interplay of satisfaction with kinesiophobia and pain as independent and interacting factors could inform targeted interventions aimed at optimizing recovery and patient-centered care after TKA.

4.4. Strengths of This Study

The current study tried to cover a research gap of patient satisfaction after TKA mainly in relation to variables such as postoperative pain and kinesiophobia. Kinesiophobia has been studied in patients after TKA and has been associated with factors, such as age, gender, postoperative pain, self-efficacy, reduced functional status, and quality of life. Equally crucial for the progress of the rehabilitation is patients' satisfaction. The relationship of kinesiophobia to patient satisfaction in the hospital after TKA surgery has not been studied; thus, a major strength of this study is the examination of all three variables, i.e., kinesiophobia, satisfaction, and pain, in the same study. Finally, any differences between different time intervals from the day of surgery in kinesiophobia, satisfaction, and pain have not been assessed until now, which is another strength of the current study.

5. Conclusions

The results of this study indicate that satisfaction, kinesiophobia, and pain are closely interrelated following TKA and change over time during the rehabilitation process. Understanding the interaction between these variables may support more individualized and effective rehabilitation strategies aimed at improving overall patient recovery. Further research with larger and more representative samples is warranted to confirm and expand upon these findings.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

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