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Which patients are satisfied with their overall outcome but dissatisfied with their return to recreational activities after total knee arthroplasty?

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ABSTRACT

Background: The primary aim of this study was to assess whether patients dissatisfied with both recreational activities and overall outcome were different to those dissatisfied with recreational activities but satisfied with their overall outcome one year after total knee arthroplasty (TKA).
Methods: A retrospective cohort consisting of 3324 primary TKA were identified from an established arthroplasty database. Patient demographics, comorbidities, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Short Form (SF) 12 scores were collected pre-operatively and one year post-operatively. Overall patient satisfaction and satisfaction with recreational activities were assessed at one year.
Results: The rate of patient satisfaction with recreational activities ($n = 2672$, 80.4%) was significantly (odds ratio (OR) 0.47, 95% confidence intervals (CI) 0.41 to 0.54, $p < 0.001$) lower than satisfaction with the overall outcome ($n = 2982$, 89.7%). When adjusting for confounding variables older age (OR 1.03, $p = 0.008$), increasing BMI (OR 1.05, $p = 0.01$) and absence of hypertension (OR 0.66, $p = 0.02$) were independent predictors of being dissatisfied with recreational activities in isolation. The one-year components and total WOMAC scores were significant ($p < 0.001$) predictors of satisfaction with recreational activities and were reliable with an area under the curve of ≥0.82
Conclusion: Patients of older age, higher BMI and without hypertension are more likely to be dissatisfied with recreational activities despite being satisfied with their overall outcome.

1. Introduction

The rate of total knee arthroplasty (TKA) continues to increase year on year and is projected to increase by approximately 143% by 2050 [1]. The elderly population of today has increasing functional demands with increasing expectations of return to recreational activities in their retirement [2]. Younger patients have increased expectations of return to sporting activities, such as walking, but only half return to their preferred activity after TKA [3]. There are a small number of studies reporting recreational activity as an expectation achieved or alternatively as a rate of return to a specific sporting activity [4–6].

Assessment of patient satisfaction after surgical interventions is becoming an important measure of established orthopaedic procedures that enables the value to patients to be recognised [7]. The reported satisfaction rate after TKA varies between 75% and 97% [4,8–10]. Multiple factors, both patient specific and surgeon specific, have been identified to influence the rate of overall

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satisfaction after TKA [11]. Noble et al. [4] reported the fulfilment of expectation of activities to be approximately 66%, but no indication as to which patients are at risk of failing to fulfil this expectation was made. A recent study found the rate of dissatisfaction with recreational activities (21%) to be approximately double that of dissatisfaction with the overall outcome (10%) of TKA [12]. In addition, it was also demonstrated that depression, back pain, and overall generic physical and mental health were common independent predictors of the rate of satisfaction with recreational activities and overall satisfaction after TKA [12]. What remains unknown is whether there are independent predictors of dissatisfaction with recreational activities for patient who are otherwise satisfied with the overall outcome of their TKA.

The primary aim of this study was to assess whether patients dissatisfied with recreational activities and overall outcome were different to those dissatisfied with both overall and recreational activities one year after TKA (total knee arthroplasty). The secondary aims were to identify independent predictors of satisfaction with recreational activities after TKR and whether one-year functional measures predict satisfaction with recreational activities.

2. Patients and methods

Patients for this study were identified retrospectively from a prospectively compiled arthroplasty database held at the study institution. During a 14 year period 3791 patients undergoing primary TKA at a single institution were asked to complete a pre-operative patient questionnaire. The Strengthening the Reporting of Observational studies in Epidemiology (STROBE) diagram is given in Figure 1. There were 3324 TKA performed during the study period with complete pre- and post-operative data that met the inclusion criteria. Of these, there were 1517 male patients and 1807 female patients, with a mean age of 69.1 (SD 9.7) years (Table 1).

Patient satisfaction with recreational activities was assessed one year following surgery by asking: "How satisfied are you with the results of your knee replacement surgery for improving your ability to do recreational activities (such as taking walks, swimming, bicycling, playing golf, dancing, going out with friends)?" In addition, satisfaction with overall outcome was assessed by asking

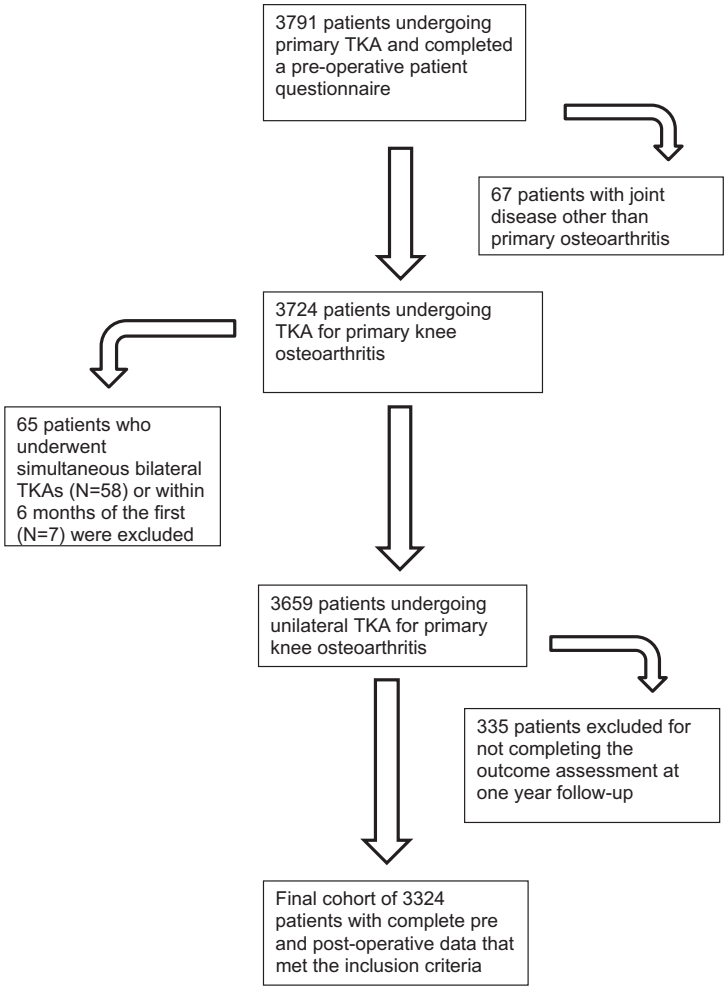

Figure 1. STROBE diagram of patient enrollment.

Table 1
Patient demographics and pre-operative functional scores according level of satisfaction with recreational activities after TKA.

Demographic	Descriptive	All patients n = 3324	Level of satisfaction				p-Value[a]
			Very satisfied n = 1626	Satisfied n = 1046	Dissatisfied n = 426	Very dissatisfied n = 226	
Gender	Male	1517 (45.6)	787 (48.4)	462 (44.2)	184 (43.2)	84 (37.2)	0.004[b]
(n, % of group)	Female	1807 (54.4)	839 (51.6)	584 (55.8)	242 (56.8)	142 (62.8)	
Mean age (years: mean, SD)		69.1 (9.7)	68.8 (9.3)	69.8 (9.8)	69.2 (10.2)	68.2 (10.5)	0.03
BMI (kg/m^2: mean, SD)		30.0 (6.5)	29.4 (4.9)	30.5 (8.8)	30.6 (5.2)	31.0 (5.7)	<0.001
Comorbidity	Heart disease	520 (15.6)	215 (13.2)	187 (17.9)	84 (19.7)	34 (15.0)	0.001
(n, % of group)	Hypertension	1665 (50.1)	791 (48.6)	547 (52.3)	210 (49.3)	117 (51.8)	0.29
	Lung disease	474 (14.3)	206 (12.7)	152 (14.5)	64 (15.0)	52 (23.0)	<0.001
	Cancer	144 (4.3)	73 (4.5)	47 (4.5)	17 (4.0)	7 (3.1)	0.77
	Neurological disease	180 (5.4)	80 (4.9)	57 (5.4)	31 (7.3)	12 (5.3)	0.30
	Diabetes mellitus	385 (11.6)	146 (9.0)	150 (14.3)	44 (10.3)	45 (19.9)	<0.001
	Gastric ulceration	407 (12.2)	157 (9.7)	147 (14.1)	58 (13.6)	45 (19.9)	<0.001
	Kidney disease	91 (2.7)	36 (2.2)	32 (3.1)	15 (3.5)	8 (3.5)	0.31
	Liver disease	47 (1.4)	13 (0.8)	18 (1.7)	9 (2.1)	7 (3.1)	0.01
	Anaemia	200 (6.0)	80 (4.9)	75 (7.2)	27 (6.3)	18 (8.0)	0.06
	Depression	420 (12.6)	153 (9.4)	126 (12.0)	80 (18.8)	61 (27.0)	<0.001
	Back pain	1507 (45.3)	604 (37.1)	525 (50.2)	253 (59.4)	125 (55.3)	<0.001
Functional measures (mean, SD)							
WOMAC	Total	36.7 (16.7)	39.8 (16.9)	35.4 (15.8)	32.3 (15.8)	28.8 (15.2)	<0.001
	Pain	35.3 (18.0)	38.1 (18.2)	33.8 (17.2)	31.5 (17.2)	29.3 (17.5)	<0.001
	Function	37.0 (17.4)	39.7 (21.30)	36.8 (19.5)	34.3 (20.7)	31.4 (20.7)	<0.001
	Stiffness	37.5 (20.8)	39.7 (21.3)	36.8 (19.5)	34.3 (20.7)	31.4 (20.8)	<0.001
SF-12	PCS	28.1 (7.6)	29.3 (7.7)	27.5 (7.2)	26.5 (7.1)	24.8 (7.3)	<0.001
	MCS	47.2 (13.5)	50.6 (12.8)	45.0 (13.1)	43.0 (13.6)	41.0 (13.4)	<0.001

[a] ANOVA unless stated otherwise.
[b] Chi square.

"Overall how satisfied are you with the results of your knee replacement surgery?" The response to each question was recorded using a four point Likert scale: very satisfied, somewhat satisfied, somewhat dissatisfied, and very dissatisfied. The focus of these questions had been previously determined by an expert consensus panel and was thought to reflect various facets of patient function most affected by a TKA and to a reliable measure of satisfaction after TKA [13]. To allow for categorical analysis patients that were very satisfied and satisfied were categorised as satisfied and those that were dissatisfied or very dissatisfied as dissatisfied.

Basic patient demographics, body mass index (BMI) and comorbidities were recorded. Comorbidities were recorded as a categorical yes and no for: heart disease, hypertension, lung disease, diabetes, stomach ulcer, kidney disease, liver disease, anaemia, cancer, depression, neurological disease, and back pain. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) [14] score and Short Form (SF-) 12 score [15] were assessed pre-operatively and one year post-operatively.

The WOMAC [14] score used in this study has been previously validated with use of three separate subscales: pain, physical function, and stiffness [16]. Interpretation of such final scores, *as per* recent recommendations, uses the reverse option, from 0 (worst) to 100 (best) [17]. A recent systematic review defined the minimal clinically important difference (MCID) in the WOMAC pain component to be 12 and 13 for the functional component [18].

The SF-12 is a generic assessment tool which assesses patient wellbeing *via* a physical component summary (PCS) and a mental component summary (MCS) [15]. Again, both the SF-12 PCS and MCS range from 0 (worst level of functioning) to 100 (best level of functioning).

2.1. Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences version 17.0 (SPSS Inc., Chicago, IL, USA). The data assessed demonstrated a normal distribution and parametric tests were used to assess continuous variables for significant differences between groups. Student's t-test, unpaired and paired was used to compare linear variables between groups. Dichotomous variables were assessed using a Chi square test. All variables were included in a multivariate logistic regression analyses to identify independent pre-operative predictors of satisfaction with recreational activity and dissatisfaction with recreational activities in isolation (satisfied with overall outcome). Receiver operating characteristic (ROC) curve analysis was used to identify predictors and thresholds (cut points) for the change in functional scores for satisfaction according to the focus of the question. The area under the curve (AUC) ranges from 0.5, indicating a test with no accuracy, to 1.0 where the test is perfectly accurate by identifying all satisfied patients. The threshold is equivalent to the point (WOMAC score) at which the sensitivity and specificity are maximal in predicting patient satisfaction [19]. A p-value of <0.05 was defined as statistically significant.

There was no additional patient contact and as such this project was performed as a service evaluation without the need for formal ethical approval. The project was registered with the institution's audit department (Project Record Number 2840) and was conducted in accordance with the Declaration of Helsinki and the guidelines for good clinical practice.

3. Results

3.1. Cohort characteristics

The patient demographics, comorbidities and functional scores for the study cohort are illustrated in Table 1.

3.2. Satisfaction with recreational activities

Univariate analysis according to level of satisfaction demonstrated gender, age, BMI, numerous comorbidities and all pre-operative functional measures were significant predictors of satisfaction with level of recreational activities after TKA (Table 1). Logistic regression analysis identified satisfaction with recreational activities was independently influenced by depression (odds ratio (OR) 0.69, $p = 0.007$), back pain (OR 0.68, $p < 0.001$), WOMAC function score (OR 0.1.02, $p = 0.006$), and SF-12 physical (OR 1.04, $p < 0.001$) and mental (OR 1.03, $p < 0.001$) health components (Table 2).

3.3. Satisfaction with recreational activities versus satisfaction with overall outcome

The overall rate of patient satisfaction with recreational activities ($n = 2672$, 80.4%) was significantly (OR 0.47, 95% confidence intervals (CI) 0.41 to 0.54, $p < 0.001$) lower than satisfaction with the overall outcome ($n = 2982$, 89.7%). Analysis of the 652 patients that were dissatisfied with their ability to do recreational activities revealed 304 (46.6%) patients that were also dissatisfied with their overall outcome, with 348 (53.4%) patients being dissatisfied with recreational activities in isolation (Table 3). Univariate analysis identified older age, as the only significant predictor of dissatisfaction with recreational activity in isolation (Table 4). When adjusting for confounding variables older age (OR 1.03, $p = 0.008$), increasing BMI (OR 1.05, $p = 0.01$) and absence of hypertension (OR 0.66, $p = 0.02$) were independent predictors of being dissatisfied with recreational activities in isolation (Table 5).

3.4. WOMAC scores according to level of satisfaction with recreational activities

There were significant improvements in the WOMAC pain (43.9, 95% CI 43.0 to 44.8, $p < 0.001$), function (38.0, 95% CI 37.2 to 38.7, $p < 0.001$), stiffness (35.1, 95% CI 34.2 to 36.0, $p < 0.001$), and total (39.4, 95% CI 38.6 to 40.0, $p < 0.001$) scores, and SF-12 PCS (10.4, 95% CI 10.0 to 10.7, $p < 0.001$) and MCS (2.3, 95% CI 1.8 to 2.7, $p < 0.001$) scores. There was a significantly greater improvement in the WOMAC scores for increasing level of patient satisfaction with recreational activities after TKA (Table 6). However, all levels of satisfaction had a significant improvement in the components and the total WOMAC scores (Table 6), which were beyond the MCID. ROC curve analysis identified threshold values in the one year WOMAC scores that predicted patient satisfaction with recreational activities (Figure 2) and with overall outcome (Figure 3).

Table 2
Bivariate regression analysis was used to assess patient demographics and pre-operative functional scores for predictors for satisfaction with activities after TKA. All variables from Table 1 were all entered into the model using "enter" methodology (Nagelkerke $R^2 = 0.2$). The p-values highlighted in bold represent statistical significance.

Demographic	Descriptive	OR	95% CI		p-Value
			Lower	Upper	
Gender	Female	Reference			
	Male	0.94	0.77	1.14	0.50
Mean age		0.99	0.98	1.00	0.07
BMI		0.99	0.98	1.01	0.28
Comorbidity	Not present	Reference			
	Heart disease	0.82	0.64	1.05	0.12
	Hypertension	1.09	0.89	1.32	0.41
	Lung disease	0.88	0.68	1.13	0.32
	Diabetes mellitus	0.90	0.68	1.20	0.46
	Stomach ulcer	0.87	0.67	1.14	0.32
	Kidney disease	1.01	0.59	1.74	0.96
	Liver disease	0.60	0.31	1.16	0.13
	Anaemia	1.25	0.85	1.85	0.25
	Cancer	1.38	0.85	2.23	0.20
	Depression	0.69	0.53	0.91	**0.007**
	Neurological disease	1.04	0.70	1.55	0.85
	Back pain	0.68	0.56	0.83	<**0.0001**
Functional measure					
WOMAC	Pain	1.00	0.99	1.1	0.35
	Function	1.02	1.00	1.03	**0.006**
	Stiffness	1.00	0.99	1.00	0.24
SF-12	PCS	1.04	1.03	1.06	<**0.0001**
	MCS	1.03	1.02	1.04	<**0.0001**

Table 3
Number of patients satisfied or dissatisfied with their overall outcome and with recreational activities one year after TKA.

		Recreational activity (n)		Total
		Satisfied	Dissatisfied	
Overall	Satisfied	2634	348	2982
(n)	Dissatisfied	38	304	342
	Total	2672	652	3324

4. Discussion

This study has demonstrated that the satisfaction with improving ability to perform recreational activities one year after TKA was significantly lower than that observed for overall satisfaction. Comorbidities of depression, back pain, less pre-operative symptoms of stiffness, and worse generic physical and mental health were independent predictors of dissatisfaction with ability to perform recreational activities after TKA. Patients of older age, greater BMI and without hypertension were more likely to be dissatisfied with their ability to perform recreational activities, despite being satisfied with their overall outcome. An increasing level of satisfaction with recreational activities was associated with a significantly greater improvement in the WOMAC scores, but all groups had a significant improvement that was beyond the MCID. However, a greater improvement in the WOMAC scores, except for stiffness, was required to achieve satisfaction with recreational activities compared to overall satisfaction.

The major limitation of this study was the retrospective design that did not enable further qualitative assessment of why patients were dissatisfied with their recreational activity. The satisfaction question asked to assess recreational activity used has been previously validated [13], but it is not clear how the response relates to different activities or whether there are other joint problems that inhibit their functional activity. Future studies could investigate the dissatisfied group further, identifying the reasons why the patients are not satisfied and whether this is an expectation mismatch, due to concomitant health problems, or limitations of their TKA. Future studies could also assess which specific activities patients wish to return to and whether this affects their post-operative satisfaction. A further limitation of this study was the relatively early assessment of patient satisfaction at one year following surgery. Potentially some patients' perception of their function may continue to improve after this time point and hence their level of satisfaction may change [20]. A long term follow-up study demonstrated preservation of sporting activity, but a decrease for those patients participating in higher impact sports [21].

This study focused on the patient-related outcome measures (PROMs) scores, patient demographics and levels of satisfaction but did not assess the knee kinematics. It could be argued that achieving a well aligned knee arthroplasty with optimal post-operative range of movement would impact upon individual patient reported level of satisfaction, both overall and related to

Table 4
Patient demographics and pre-operative functional scores for those dissatisfied with recreational activities with those dissatisfied with overall outcome and recreational activities after TKA.

Demographic	Descriptive	Dissatisfaction		OR/*difference*	95% CI	p-Value[a]
		Recreation n = 348	Overall & recreation n = 304			
Gender	Male	144 (41.4)	124 (40.8)	1.03	0.75 to 1.40	0.90[b]
(n, % of group)	Female	204 (58.6)	180 (59.2)			
Mean age (years: mean, SD)		69.7 (10.1)	67.9 (10.4)	1.8	0.2 to 3.4	**0.02**
BMI (kg/m^2: mean, SD)		31.1 (5.4)	30.3 (5.3)	0.8	−0.1 to 1.6	0.08
Comorbidity	Heart disease	68 (19.5)	50 (16.4)	0.81	0.54 to 1.21	0.31
(n, % of group)	Hypertension	168 (48.2)	159 (52.3)	1.18	0.86 to 1.60	0.31
	Lung disease	60 (17.2)	56 (18.4)	1.08	0.73 to 1.62	0.69
	Cancer	15 (4.3)	9 (3.0)	0.68	0.29 to 1.57	0.36
	Neurological disease	23 (6.6)	20 (6.6)	1.00	0.54 to 1.85	0.99
	Diabetes mellitus	41 (11.8)	48 (15.8)	1.40	0.90 to 2.20	0.14
	Gastric ulceration	56 (16.1)	47 (15.5)	0.95	0.63 to 1.46	0.83
	Kidney disease	13 (3.7)	10 (3.3)	0.88	0.38 to 2.03	0.76
	Liver disease	7 (2.0)	9 (3.0)	1.49	0.55 to 4.04	0.44
	Anaemia	26 (7.5)	19 (6.3)	0.83	0.45 to 1.52	0.54
	Depression	70 (20.1)	71 (23.4)	1.21	0.83 to 1.76	0.32
	Back pain	198 (56.9)	180 (59.2)	1.10	0.81 to 1.50	0.55
Functional measures (mean, SD)						
WOMAC	Total	30.1 (15.9)	32.3 (15.4)	2.3	−0.1 to 4.7	0.07
	Pain	30.0 (16.6)	31.7 (17.2)	1.7	−1.4 to 4.4	0.20
	Function	29.8 (16.6)	32.3 (15.9)	2.4	−1.3 to 5.0	0.055
	Stiffness	32.3 (21.2)	34.4 (20.0)	2.1	−1.6 to 5.2	0.21
SF-12	PCS	25.6 (7.0)	26.3 (7.5)	0.7	−1.1 to 1.8	0.20
	MCS	42.1 (14.1)	42.7 (13.0)	0.6	−1.5 to 2.7	0.58

[a] t-Test unless stated otherwise.
[b] Chi square.

Table 5
Bivariate regression analysis was used to assess patient demographics and pre-operative functional scores for predictors of patients that were more likely to be dissatisfied with their recreational activity after TKA when compared to patients dissatisfied with their overall outcome and recreational activities. All variables from Table 4 were all entered into the model using "enter" methodology (Nagelkerke $R^2 = 0.1$). The p-values highlighted in bold represent statistical significance.

Demographic	Descriptive	OR	95% CI		p-Value
			Lower	Upper	
Gender	Male	Reference			
	Female	0.87	0.61	1.23	0.43
Mean age		1.03	1.01	1.04	**0.008**
BMI		1.05	1.01	1.08	**0.01**
Comorbidity	Not present	Reference			
	Heart disease	1.10	0.71	1.70	0.66
	Hypertension	0.66	0.47	0.94	**0.02**
	Lung disease	0.86	0.56	1.34	0.51
	Diabetes mellitus	0.69	0.42	1.3	0.14
	Stomach ulcer	0.95	0.60	1.50	0.82
	Kidney disease	0.86	0.34	2.17	0.76
	Liver disease	0.66	0.23	1.87	0.43
	Anaemia	1.38	0.69	2.76	0.37
	Cancer	1.57	0.64	3.87	0.33
	Depression	0.91	0.58	1.42	0.67
	Neurological disease	0.91	0.45	1.82	0.78
	Back pain	0.87	0.61	1.23	0.42
Functional measure					
WOMAC	Pain	1.00	0.99	1.02	0.86
	Function	0.99	0.97	1.01	0.22
	Stiffness	1.00	0.99	1.01	0.99
SF-12	PCS	1.00	0.98	1.02	0.76
	MCS	0.99	0.98	1.01	0.46

recreational activities. However, this specific data was not collected for the current study but it was found that WOMAC stiffness score was the only subset that did not require an improvement post-operatively in order to achieve satisfaction with recreational activities compared to overall satisfaction.

A recent study by Naili et al. [23] found patient-reported levels of function in TKA post-operative patients to be higher than the objectively measured functional performance of their knees. Baker et al. [24] found pain to be a stronger predictor of satisfaction than function. Self-reported measures of function have been found to be strongly related to reduction in pain [25]. If pain has been noticeably reduced then the patient's perceived level of function may be over-estimated [25]. Matsuda et al. [22] found a negative correlation between varus alignment and patient satisfaction; however, they assessed satisfaction using the satisfaction-related questions in the Knee Society Scoring System rather than a specific satisfaction grading scale as used in the current study. Furthermore, Hujibregts et al. [26] reported that neither mechanical axis nor component alignment was associated

Table 6
Post-operative outcome measures and the difference relative to pre-operative scores for the all patients and according to level of patient satisfaction with recreational activity one year after TKA.

Functional measure		Level of satisfaction				p-Value[a]
		Very satisfied	Satisfied	Dissatisfied	Very dissatisfied	
WOMAC						
Total	One year	88.4 (11.2)	71.5 (15.9)	56.4 (16.1)	44.9 (19.9)	<0.001
	Change	48.6	36.2	23.9	15.8	<0.001
	(95% CI)	(47.7–49.5)	(35.1–37.3)	(22.2–25.6)	(13.3–18.4)	
	p-Value[b]	<0.001	<0.001	<0.001	<0.001	
Pain	One year	91.1 (16.5)	75.5 (20.7)	62.3 (21.0)	49.8 (24.0)	<0.001
	Change	52.0	41.7	30.8	20.4	<0.001
	(95% CI)	(50.9–53.1)	(40.2–43.2)	(28.5–33.0)	(17.2–23.7)	
	p-Value[b]	<0.001	<0.001	<0.001	<0.001	
Function	One year	88.0 (12.3)	70.3 (16.8)	54.2 (17.2)	42.9 (20.0)	<0.001
	Change	47.6	34.6	21.8	14.5	<0.001
	(95% CI)	(46.7–48.6)	(33.5–35.8)	(20.1–23.5)	(12.0–17.1)	
	p-Value[b]	<0.001	<0.001	<0.001	<0.001	
Stiffness	One year	884.0 (16.0)	68.5 (19.8)	54.1 (20.2)	44.3 (24.3)	<0.001
	Change	44.3	31.7	19.8	12.8	<0.001
	(95% CI)	(43.1–45.5)	(30.3–33.2)	(17.4–22.2)	(9.6–16.1)	
	p-Value[b]	<0.001	<0.001	<0.001	<0.001	

[a] ANOVA.
[b] Paired t-test.

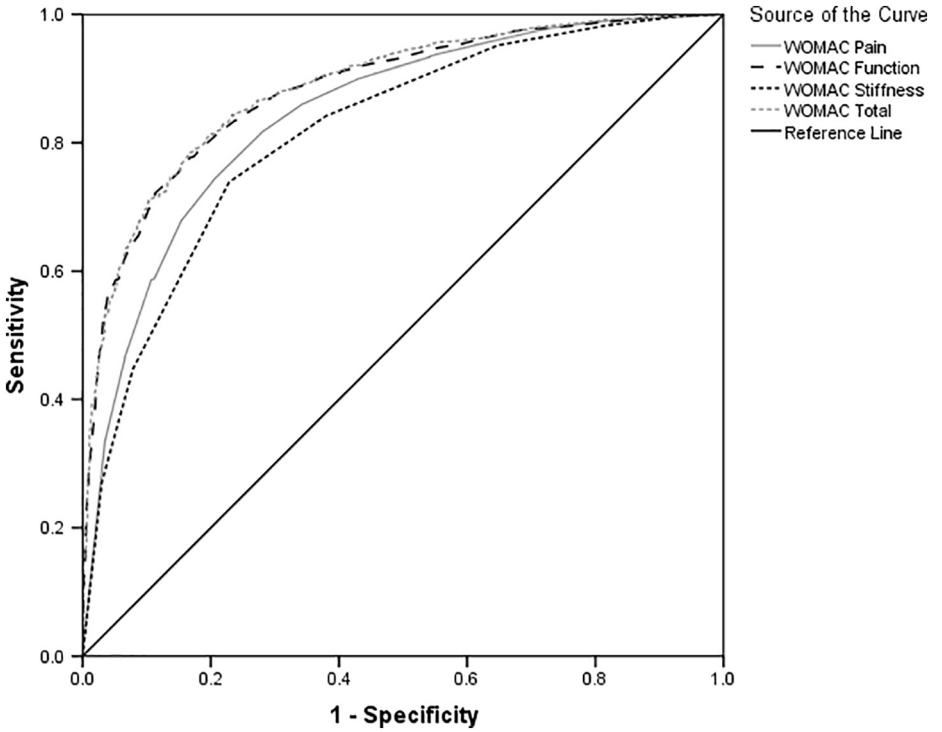

Figure 2. ROC curves for predicting satisfaction with recreational activities after TKA using the components and total WOMAC scores at one year.

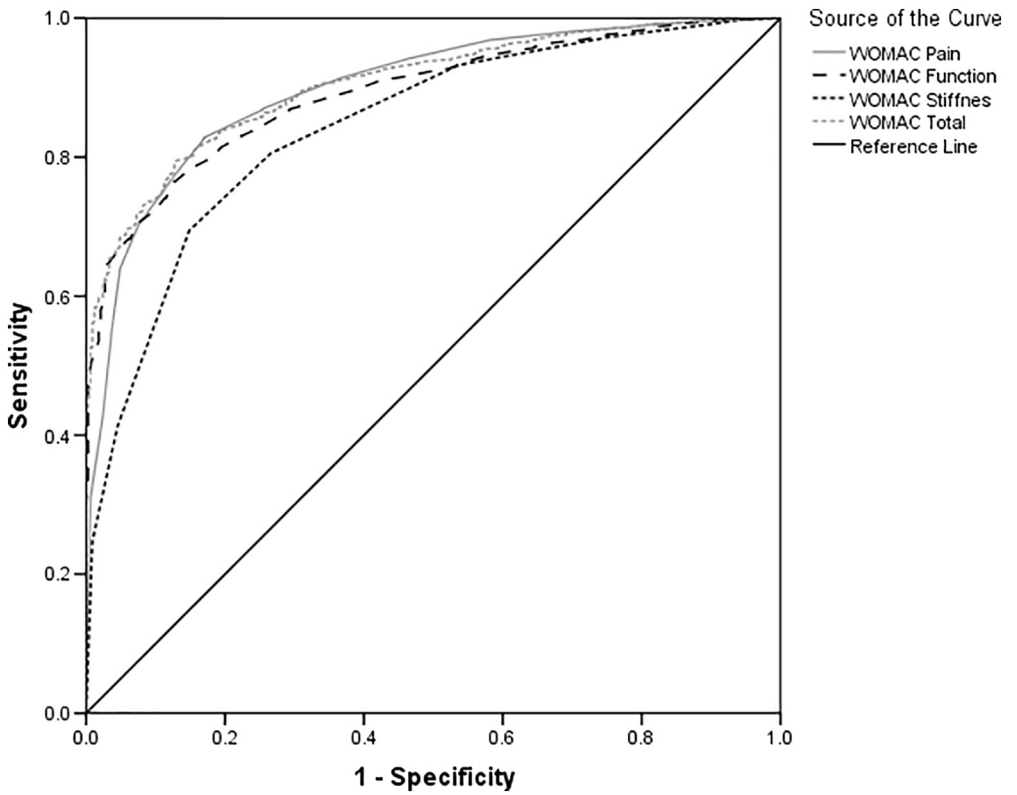

Figure 3. ROC curves for predicting overall satisfaction after surgery using the components and total WOMAC scores at one year.

with patient satisfaction but that pain reduction was important for post-operative satisfaction. Hujibregts et al. [26] also used a Likert scale to assess satisfaction, similar to the tool used in the current paper.

Noble et al. [4] assessed patient levels of satisfaction with TKA and its association with function and expectations. Regarding activities they assessed fulfilment of expectation rather than level of satisfaction, but these two concepts are closely linked [27] and so the rate of satisfaction with recreational activity of 79% in the current study is a novel finding and greater than the rate of fulfilment of expectation with activities of 66% described by Noble et al. [4]. As the current study did not assess expectations it is limited in providing an explanation for this higher rate of satisfaction. However, as the manuscript from Noble et al. [4] is 12 years old a potential reason for the rise in satisfaction rates could be an increase in arthroplasty patient fitness leading to higher expectations [2]. Improvements in pre-operative counselling and expectation management may also explain this change.

In addition, the current study has shown older age as a predictor of dissatisfaction with recreational activities in patients that were satisfied with their overall outcome. This could be used to guide the clinician in the pre-operative setting with an older but active patient so that he/she is informed about which aspects post-operative rehabilitation they may be less satisfied with. The current finding in this work is in contrast to previous studies that have demonstrated younger age to be associated with decreased fulfilment of expectation with return to recreational activities [28,29]. This difference may be due to a mismatch of patient expectation and the limited potential of achievement [30] which was not assessed in the current study.

Age is a consideration in the evaluation of satisfaction for return to recreational activity after joint surgery. Whilst older patients may have comparatively lower expectations of what they can achieve post-operatively, when the expectations are considered relative to what they can potentially achieve, there may in fact be a greater mismatch compared to a young cohort. It is recognised that some expectations, such as walking without a stick increase with older age but are only fulfilled in approximately 60% of patients [31]. Furthermore, although Von Keudell et al. [28] and Klit et al. [29] found that younger patients' level of satisfaction was not consistent with the increased level of knee function, this finding is not replicated throughout the literature; Goh et al. [32] found high levels of post-operative satisfaction (88.8%) in a cohort of TKA patients under the age of 50 years. However, Von Keudell et al. [28] were making comparison with patients undergoing unicondylar knee replacement and we believe that interpretation of the work of Klit et al. [29] and Goh et al. [32] is limited by the fact that they have no older cohort group for comparison.

The difference in the threshold values for the each of the post-operative WOMAC scores that predict satisfaction has been demonstrated previously [33]. However, current study used the change in the WOMAC scores to predict satisfaction with recreational activities and overall satisfaction, which is original. Giesigner et al. [33] demonstrated a similar variation in the threshold values for the components and total WOMAC scores to achieve satisfaction. However, a greater improvement in the WOMAC scores was required to achieve satisfaction with recreational activities compared to achievement of overall satisfaction, which is an original finding. Hence despite all levels of patient satisfaction, including those that were very dissatisfied, achieving the MCID in the WOMAC a greater improvement is required to attain satisfaction with recreational activities. What the patient defines as their satisfaction with ability to do recreational activities is not clear from the current data. Depending of the activity there may be different threshold levels in the WOMAC scores to achieve satisfaction with return to each specific sporting activity.

5. Conclusion

Patients of older age, higher BMI and without hypertension are more likely to be dissatisfied with recreational activities despite being satisfied with their overall outcome.

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Ethics

No additional patient contact and as such this project was performed as a service evaluation without the need for formal ethical approval. The project was registered with the institutions audit department (Project Record Number 2840) and was conducted in accordance with the Declaration of Helsinki and the guidelines for good clinical practice.

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