



# Joint perception and patient perceived satisfaction after total hip and knee arthroplasty in the American population

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## ABSTRACT

**Background:** Total hip (THA) and knee arthroplasty (TKA) are two of the most successful procedures in orthopedics. Current evaluation trends focus on patient-reported outcomes. We sought to compare the changing WOMAC scores from various time points from pre-operative to 1-year follow-up between separate THA and TKA cohorts. In addition, we compared THA and TKA patients' joint perception, satisfaction, and function via a questionnaire.

**Methods:** One hundred elective THA (n = 50) and TKA (n = 50) patients at one institution were randomly selected and contacted between 2 and 4 years after the index surgery. A questionnaire assessed joint perception, satisfaction and function of their total joint. Clinical function scores utilizing the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) from the pre-operative, 3-month and 1-year post-arthroplasty visits were compared between groups.

**Results:** 78% of the THA group perceived their replaced joint as “native” vs 32% of TKA patients. 54% of THA patients (vs 16% of TKA patients) reported uninhibited function of their total joint. 24% of TKA patients noted to be least satisfied with their total joint compared to 2% in the THA group. Both groups demonstrated significant improvement in WOMAC scores after surgery, but the mean 3-month (12.4 (THA) vs 19.3 (TKA)) and 1-year (6.5 (THA) vs 14.1 (TKA)) follow-up WOMAC scores were significantly better in the THA group.

**Conclusion:** Evaluation of a patient's joint perception is a valuable tool that should be used to assess function in conjunction with validated clinical functional scores. Our data suggest further improvements in total knee implant design and implantation strategies are necessary.

## 1. Introduction

Total hip and knee arthroplasty (THA/TKA) are regarded by the medical community as two of the most successful life altering procedures available for patients<sup>1,2</sup>. There are many ways to evaluate the success of these procedures including implant survival, complications, revision rates, and patient reported outcomes measures (PROMs)<sup>3</sup>.

Historically, the surgeon was the main judge in determining the success of a total joint arthroplasty (TJA) procedure<sup>4,5</sup>. This evolved into the traditional era of measuring clinical success by the achievement of various benchmark parameters such as full range of motion and independent ambulation while remaining free from post-operative complications<sup>6,7</sup>.

In the last few years, there has been a dramatic shift in clinical evaluation parameters across the entire healthcare industry. Patient

satisfaction data are now being directly tied to compensation<sup>8</sup> and every subspecialty field has started to acknowledge this critical component in its evaluations. Studies in TJA outcomes have noted up to 10% of THA patients<sup>2,9,10</sup> and 15–30% of TKA patients<sup>11–13</sup> report dissatisfaction following elective surgery. Perhaps even more concerning, Harris et al. reported on the discordance between patient and surgeon satisfaction after THA and TKA, highlighting the need for TJA surgeons to consider patient reported outcomes as a critical element in the overall success of the procedure<sup>14</sup>.

The correlation between patient satisfaction and joint specific outcome scores has been well documented<sup>14</sup>. The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) has been extensively utilized and remains a very reliable joint specific outcome score that has been shown to be responsive to change over time<sup>15,16</sup>. In addition, it is one of the most widely used PROMs in the setting of THA

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and TKA<sup>17</sup> as it covers 24 total items across elements of pain, stiffness, and function<sup>16</sup>. In addition to WOMAC scores, patient reported joint perception following TJA has become a critical component in outcome measures<sup>18</sup>. Several authors have demonstrated that patients reporting their artificial joint as “natural” as opposed to “artificial” are more likely to report higher rates of satisfaction and have higher outcome scores<sup>4</sup>.

The purpose of this study was two-fold: First, we sought to investigate and compare the changing WOMAC scores from various time points from pre-operative to 1-year follow-up in separate THA and TKA cohorts. Second, utilizing a basic questionnaire, we compared post-operative patient-reported total joint perception, satisfaction rates, and function following THA and TKA.

## 2. Methods

Approval was obtained from the Institutional Review Board (IRB) prior to conducting this study. We identified all patients that underwent a primary elective THA or TKA from 2009 to 2011 by a single surgeon at a single institution. We excluded bilateral TJA patients, any cases associated with other procedures, and any TJA procedure that was not elective (i.e. traumatic). Fifty patients were selected at random from each of the elective THA and TKA groups, yielding 100 patients in total. These patients were contacted by phone by an orthopedic resident between 2- and 4-years out from their procedure and each was asked to answer a questionnaire assessing their joint perception, satisfaction and function after undergoing the replacement (Table 1). In terms of patient satisfaction, the questionnaire asked each patient to rate his or her level of satisfaction on a scale of 1–10. Lower scores (= 1–6) were associated with some level of patient dissatisfaction while higher scores (= 7–10) were considered “overall satisfied” with the TJA.

Additionally, clinical function scores using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) from the pre-operative visit as well as the 3-month and 1-year post-operative follow-up time points were compared between the THA and TKA groups. The overall scores were compared in addition to the magnitude of score changes from the pre-operative period to each of the follow-up time points (Fig. 1). In addition, the post-operative time points were compared to one another (Fig. 1).

The two groups were compared using the Student *t*-test and the chi-square test for continuous and categorical variables, respectively. Distribution parameters (means, standard deviations (SDs), frequencies, and proportions) were used to describe the study patient sample. Patient demographics (age, gender, BMI) and clinical variables (ASA scores and tourniquet times) were collected from individual chart reviews (Table 2). Data were analyzed using SPSS Statistical Software (IBM Corporation 2012, Somers, NY, USA).

**Table 1**  
Patient questionnaire assessing total joint perception, satisfaction, and function.

Questions	Answer Choices
Question 1: “How do you perceive your hip or knee after undergoing total hip or knee replacement?”	#1: Like a native or natural joint  #2: Like an artificial joint with no restriction #3: Like an artificial joint with minimal restriction #4: Like an artificial joint with major restriction #5: Like a nonfunctional joint
Question 2: “How do you rate your satisfaction after undergoing the total joint arthroplasty on a scale from 1 to 10?”	A score of 1 indicating the worst possible and a score of 10 indicating the best possible result
Question 3: “How would you rate the function of your joint after replacement?”	#1: I can do anything #2: I can do most things #3: I feel limited #4: I feel severely limited

## 3. Results

The mean ages were similar between the TKA and THA cohorts (67.12 +/- 8.6 years and 63.14 +/- 8.7 years, respectively; *p* = 0.226) (Table 2). By comparison, the TKA cohort was comprised of more females (72% vs 38%, *p* < 0.001), had higher ASA scores (*p* = 0.008), and mean BMI values were higher (31.6 +/- 7.2 vs 28.7 +/- 4.5, *p* = 0.02) than the THA cohort (Table 2).

Both the THA and TKA groups were found to have a similar mean pre-operative WOMAC scores of 46.8 and 45.9, respectively (*p* = 0.832, Fig. 1). However, the mean 3-month and 1-year post-arthroplasty WOMAC scores were significantly better in the THA group (12.4 and 6.5, respectively) compared to the TKA group (19.3 and 14.1, respectively) at both time points (*p* = 0.014 and *p* = 0.047, respectively) (Fig. 1). The relative changes in WOMAC scores from the pre-operative to each of the post-operative visits, 3-month (= “D1”) and 1-year (= “D2”), favored greater relative score changes in the TKA group, but this difference did not reach statistical significance (Fig. 1). Likewise, the relative change between the 3-month and 1-year post-operative visits (= “D3”) were also similar between cohorts (Fig. 1).

78% of the THA group perceived their replaced joint as a “native/natural” joint with no restriction vs 32% of the patients in the TKA group (*p* = 0.003, Fig. 2). Furthermore, 46% of the patients who underwent TKA reported their perception of some level of restriction in their artificial joint compared to just 12% reporting restriction in the THA cohort (*p* = 0.002, Fig. 2).

With respect to patient satisfaction, 24% of the TKA cohort expressed some level of dissatisfaction compared to just 2% of patients undergoing THA (*p* = 0.003, Fig. 3). 98% of THA patients were “overall satisfied” with their surgery (Fig. 3).

54% of THA patients reported uninhibited function (= “I can do anything”) in response to the questionnaire compared to only 16% of the TKA cohort (*p* = 0.002, Fig. 4). Almost one-third of TKA patients reported some level of limitation in function (Fig. 4). Patients’ perception and self-reported satisfaction and function scores corroborated with their WOMAC clinical function scores.

## 4. Discussion

THA and TKA remain two of the most successful, cost-effective orthopedic procedures<sup>19</sup>. As volume and popularity continue to increase, TJA surgeons are challenged to improve results in terms of PROMs and patient satisfaction rates after surgery<sup>12,15</sup>. While we still lack a generalized definition of success following TJA, several clinical variables have been shown to play important roles in TJA outcomes. Some of these variables are system-based (e.g. hospital and/or surgeon case volumes) while many are patient-related (e.g. socioeconomic status, medical comorbidities, and preoperative patient expectations)<sup>11, 20–22</sup>. There has been a trend in the literature focused on assessing the

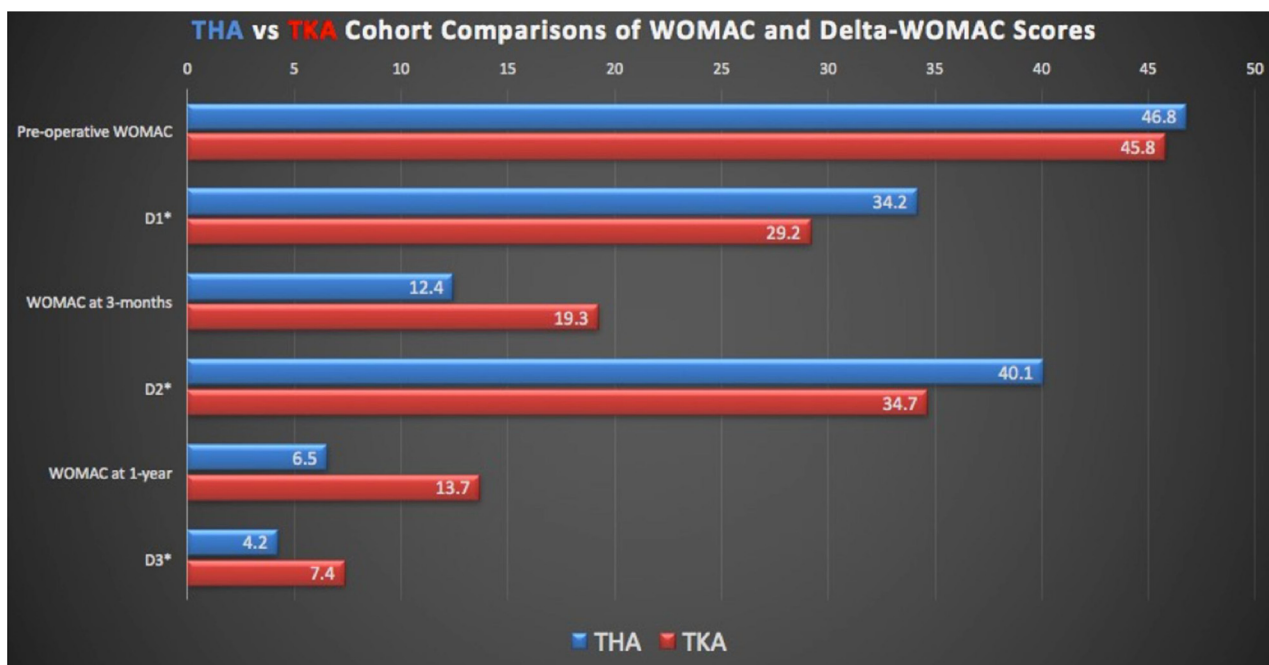


Fig. 1. WOMAC and Delta-WOMAC score comparisons between THA and TKA groups. Scores are presented as means and include the pre-operative, and 3-month and 1-year post-operative WOMAC scores. In addition, the Delta-WOMAC scores represent the change in score from the pre-operative to 3-month post-operative (= "D1") period, the pre-operative to 1-year post-operative (= "D2") period, and the 3-month to 1-year post-operative score change (= "D3").

Table 2 Patient demographic and clinical variables distributed by cohort.

Cohort	% Female	Age (years)	ASA Scores				BMI <sup>a</sup>	Tourniquet Time (min)
			1	2	3	4		
THA	38	63.14 +/- 8.7	1	36	13	0	28.7 +/- 4.5	
TKA	72	67.12 +/- 8.6	1	22	26	1	31.6 +/- 7.2	33.7 +/- 6.5
p-values	< 0.001	0.226		0.005	0.008		0.02	

Continuous variables (Age, BMI, Tourniquet time) are presented as mean +/- standard deviation.

Other abbreviations: THA = Total hip arthroplasty; TKA = Total knee arthroplasty; ASA = American Society of Anesthesiologists score.

P-values in the bottom row represent comparisons between the cohorts with respect to given variable at the  $\alpha < 0.05$  significance level; Bold values represent statistically significant differences.

<sup>a</sup> BMI = body mass index; Units of measurement are kg/m<sup>2</sup>.

relationship between THA and TKA patient-reported outcomes and patient-reported joint perception<sup>18, 24</sup>.

Our study adds to the existing body of literature reporting the aforementioned post-operative WOMAC score discrepancies in favor of THA over TKA<sup>2, 18, 25</sup>. Furthermore, our study demonstrates THA patients' perceived function and satisfaction rates were superior to those reported in the TKA cohort, and these results corroborated with their clinical function scores. While the latter is somewhat intuitive, there is a paucity of data demonstrating correlation between WOMAC scores and joint perception. Collins et al. recently showed patient joint perception strongly correlated with WOMAC scores in both THA and TKA patients<sup>18</sup>. In addition, this same study noted lower WOMAC scores and significantly worse joint perception in the TKA cohort<sup>18</sup>.

As we continue to comprehensively re-define success following TJA, the concept of joint perception rapidly evolved into its own validated PROM specific to artificial joints, known as the *Forgotten Joint Score* (FJS-12)<sup>26</sup>. The ultimate goal following elective TJA, as reported

through the FJS-12, is for patients to *forget* their artificial joint<sup>26</sup>. While we did not utilize the FJS-12 in our study, our inclusion of joint perception approximates a much broader post-operative evaluation component in TJA based on a patient's *awareness* of his or her artificial joint<sup>27</sup>. Thus, our study has provided PROMs, patient joint perception, patient satisfaction rates, and patient-reported functional levels as part of a multifaceted approach that has become the contemporary standard in evaluating overall success following elective TJA<sup>2</sup>.

Our study does have several limitations. While the mean age and mean pre-operative WOMAC scores were similar between the TKA and THA cohorts, a greater proportion of TKA patients were female and both ASA scores and mean BMI values were significantly higher in the TKA cohort (Table 2). Although no consensus has been reached regarding the impact of age, gender, and BMI with respect to relative impact on patient outcomes and satisfaction<sup>12, 22</sup>, we performed separate chi-squared analyses with respect to each clinical variable and outcome of interest, and none of these demonstrated statistical significance at the

other important variables were not factored into our study. Pre-operative expectations<sup>23</sup>, clinical depression<sup>13</sup>, and incidence of post-operative complications<sup>2</sup> have been demonstrated to negatively impact patient outcomes and satisfaction. Finally, our sample size was relatively small, although the magnitude of this limitation is somewhat diminished as we did achieve statistical significance in our primary outcome of interest.

As we move forward in a changing healthcare environment centered on PROMs and patient satisfaction rates in addition to the traditional evaluation modalities, the field of TJA is redefining its critical determinants of success. As these components continue to delineate, it is vital for orthopedic surgeons to understand the current patient-centered approach and plan the pre-operative discussion with each patient accordingly. By elucidating some of the differences between THA and TKA, we feel it is important for the TJA surgeon to discuss the greater potential for an inferior relative outcome when comparing these 2 procedures.

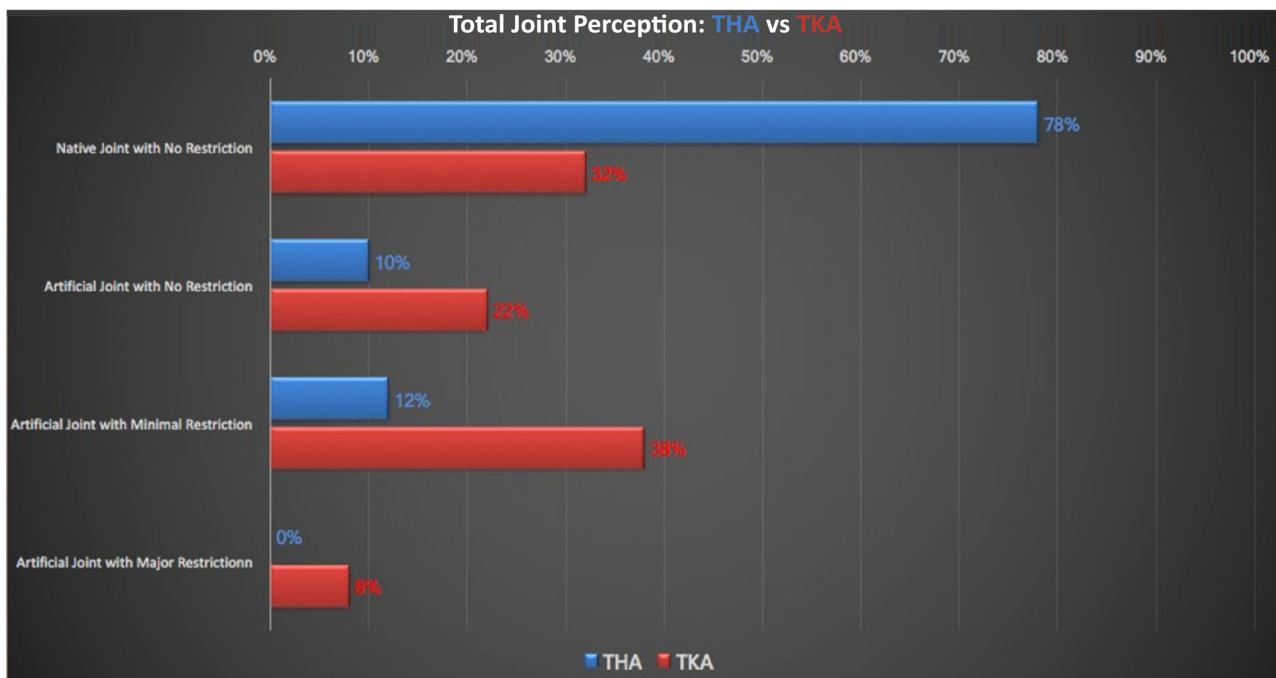


Fig. 2. Patient-reported total joint perception following THA vs TKA. All patients (n = 50) in each cohort were asked how they perceive their total joint following THA or TKA.

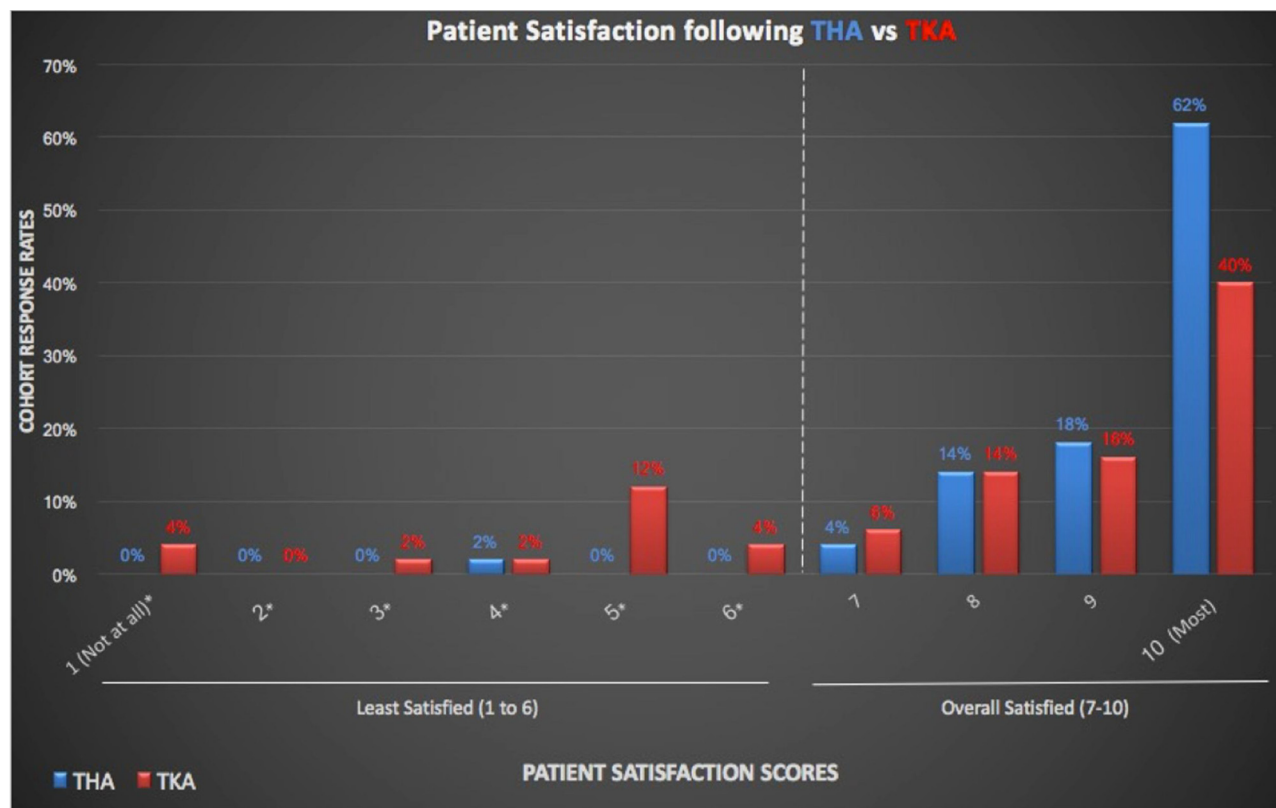


Fig. 3. Patient satisfaction scores following THA vs TKA. All patients (n = 50) in each cohort were asked to rate their level of satisfaction from 1 (=not at all satisfied) to 10 (=most satisfied). Satisfaction ratings from 1 to 6 were considered “least satisfied” ratings and are marked with an asterisk (\*). Patient satisfaction scores from 7 to 10 were considered “overall satisfied” with their procedure.

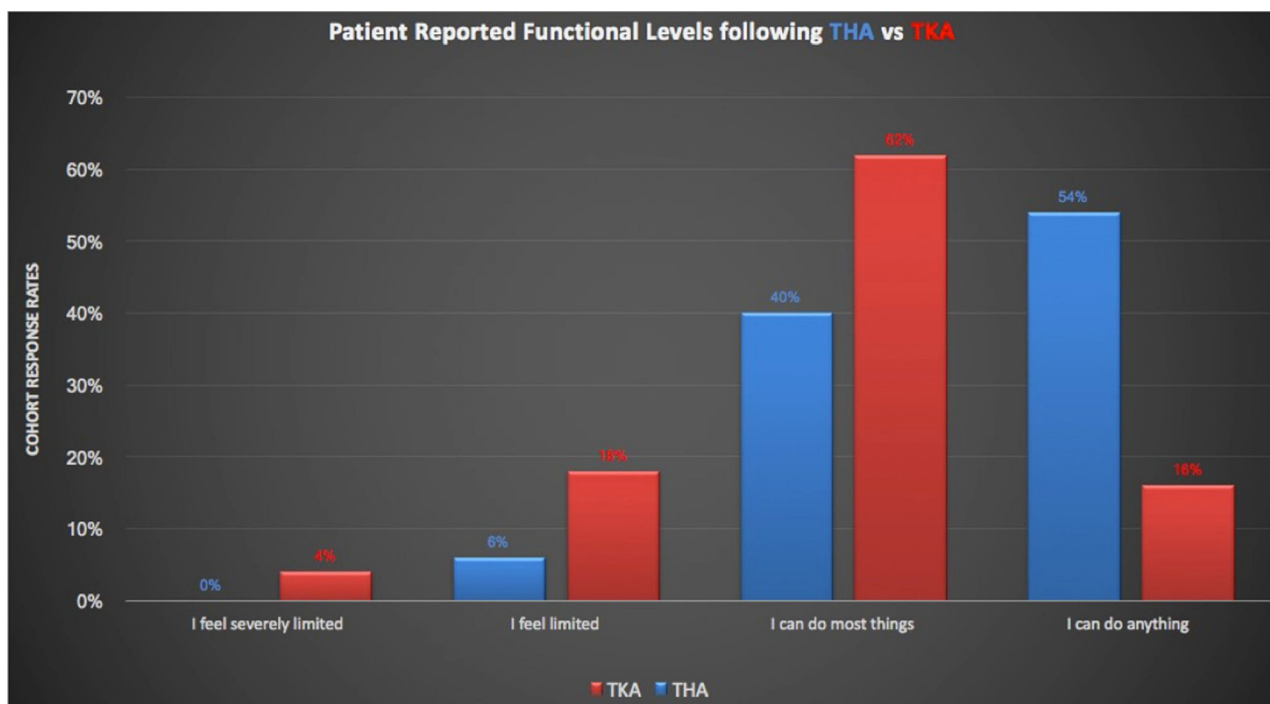


Fig. 4. Patient-reported functional levels following THA vs TKA. All patients (n = 50) in each cohort were asked to select the most appropriate response indicating their current functional level of their total joint replacement.

#### Conflict of interest statement

Each author certifies that he or she has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.

#### Ethical review committee statement

This study has been reviewed and approved by our ethical committee. We will provide the official letter as a separate attachment.

#### Study location

This research was performed at the Rothman Institute at Abington-Jefferson Health, Willow Grove, Pennsylvania.

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