

# Patient Expectations of Sexual Activity After Total Hip Arthroplasty

## A Prospective Multicenter Cohort Study

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**Background:** This study aimed to evaluate patients' expectations of postoperative sexual activity (SA) after total hip arthroplasty.

**Methods:** A prospective multicenter cohort study of 1,271 patients managed with total hip arthroplasty was performed using patient-reported outcome measures of the Longitudinal Leiden Orthopaedics Outcomes of Osteo-Arthritis Study (LOAS). Preoperative SA expectations and their fulfillment after 1 year were assessed with the Hospital for Special Surgery expectations survey. The Hip disability and Osteoarthritis Outcome Score (HOOS) was used to measure functional status, and the Short Form-12 Mental and Physical Component Summary scores (SF-12 MCS and SF-12 PCS) and EuroQol-5 Dimensions (EQ-5D) questionnaire were used to measure health status. Two subgroups were defined preoperatively: the SA-Expecting Group and the No-SA-Expecting Group. The postoperative outcomes with regard to SA (i.e., the difference between postoperative and preoperative SA scores) were classified as "unfulfilled" (score,  $\leq -1$ ), "fulfilled" (score, 0), or "exceeded" (score,  $\geq 1$ ). Multivariate regression analyses were used, with t tests to compare means between groups.

**Results:** In total, 952 (74.9%) patients returned both preoperative and postoperative HSS questionnaires. Preoperatively, 605 patients (63.6%) expected to have postoperative SA. At 1 year, 43.5% of participants reported that this expectation was unfulfilled. In the No-SA-Expecting Group, 18.2% (63 of 347) regained SA, predominantly men. Postoperative SA fulfillment was related to preoperative musculoskeletal ( $p = 0.001$ ) and non-musculoskeletal comorbidities ( $p = 0.004$ ) and the postoperative HOOS, SF-12 PCS, SF-12 MCS, EQ-5D, and EQ-5D visual analog scale (VAS) scores ( $p < 0.001$ ). Postoperative HOOS-symptoms (odds ratio [OR] 1.04; 95% confidence interval [CI], 1.02 to 1.06;  $p < 0.001$ ), and HOOS-sport (OR, 1.01; 95% CI, 1.00 to 1.03;  $p = 0.032$ ) were associated with postoperative SA fulfillment, as was older age (inversely; e.g.,  $\geq 76$  years compared with  $\leq 60$  years: OR, 0.28; 95% CI, 0.13 to 0.62;  $p = 0.002$ ). Correspondingly, for the No-SA-Expecting Group, higher age was also inversely associated with regaining postoperative SA (e.g.,  $\geq 76$  years: OR, 0.07; 95% CI, 0.02 to 0.21;  $p < 0.001$ ).

**Conclusions:** Of the patients who expected to be sexually active after surgery, 43.5% perceived this expectation to be unfulfilled; 24.3% were still sexually inactive despite most having expected a return to normal SA. Approximately one-fifth of patients who did not expect postoperative SA in fact regained SA. During preoperative consultations, surgeons should pay attention to expectation management surrounding SA.

**Level of Evidence:** Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.

Sexual activity (SA) is an important part of quality of life at all ages<sup>1,2</sup>. Osteoarthritis of the hip frequently causes painful limitation of movement<sup>3-10</sup>, which can negatively affect SA<sup>4,10,11</sup>. One-quarter of patients attributed marital unhappiness and tension in relationships to osteoarthritis<sup>4,7,9,12</sup>. Total

hip arthroplasty is an effective treatment<sup>4,13,14</sup>, and undergoing total hip arthroplasty has been associated with improvement in sexual relations<sup>3-5,7,14</sup>. However, fear of hip dislocation<sup>15</sup> and painful physical impairment (e.g., flexion contracture or limited abduction) can limit postoperative SA<sup>16</sup>.

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Mancuso et al. found that, preoperatively, younger patients, men, and patients living with a partner were more likely to expect improvement in SA<sup>17</sup>. Postoperatively, poor mental health, older age, female sex, living without a partner, and disability were associated with less fulfillment in terms of SA<sup>18-20</sup>. Other studies have focused on the differences between patient and surgeon expectations<sup>21,22</sup>, with surgeons tending to be more optimistic than patients with regard to postoperative SA<sup>21</sup>. Patients often do not ask SA-related questions and surgeons appear not to address SA expectations during consultations<sup>23</sup>. However, as patient preferences for undergoing total hip arthroplasty are a pivotal aspect of surgical decision-making<sup>21</sup>, it is important to discuss SA expectations as an outcome of total hip arthroplasty.

As SA has rarely been studied<sup>24</sup>, prospective data are needed to better understand sexual function as a measure of outcome following total hip arthroplasty<sup>24</sup>. We are not aware of any previous in-depth studies that have focused on preoperative SA expectations and postoperative SA fulfillment across the total hip arthroplasty population among both younger and older patients of both sexes.

The primary purpose of the present study was to explore the associations between patients' preoperative expectations of SA and their postoperative experience of SA. The second aim was to evaluate which preoperative and postoperative functional status and health outcome measures were associated with postoperative SA fulfillment. The third aim was to perform a multivariate regression analysis to determine which patient characteristics were associated with SA fulfillment.

## Materials and Methods

The present prospective multicenter observational cohort study was performed as part of the Longitudinal Leiden Orthopaedics Outcomes of Osteo-Arthritis Study (LOAS) (Trial ID NTR3348), which is embedded in the Dutch Arthroplasty Register (LROI)<sup>25,26</sup>. The LOAS includes all patients scheduled for primary total hip arthroplasty in 7 participating hospitals: Leiden University Medical Center, Leiden; Alrijne Hospital, Leiden and Leiderdorp (former Diaconessenhuis and Rijnland Hospital); Groene Hart Hospital, Gouda; Reinier de Graaf Hospital, Delft; LangeLand Hospital, Zoetermeer; Albert Schweitzer Hospital, Dordrecht; and Waterland Hospital, Purmerend. Patients were recruited between June 2012 and July 2015. Ethical approval was obtained from the Medical Ethics Committee at Leiden University Medical Center (registration number P12.047). Patients were included in the LOAS<sup>25,26</sup> once written informed consent was obtained in accordance with the Declaration of Helsinki.

## Instruments

Preoperatively, patients were asked to complete a validated Dutch translation of the Hospital for Special Surgery (HSS) questionnaire for total hip arthroplasty<sup>27</sup>. This questionnaire contains 17 value-based items<sup>28</sup>. The present study focused on the HSS item "What do you expect of sexual activity after surgery?" All patients with completed preoperative and postoperative HSS questionnaires were included.

Patient characteristics, including self-reported age, sex, height (cm) and weight (kg) (i.e., body mass index [BMI]), and

living status (alone or with children, with a partner with or without children, or "other" [e.g., nursing home]), were collected at baseline. Preoperatively, patients indicated their SA expectations on a 5-point Likert scale: 1 (back to normal [defined as "a return to an expected normal situation"]), 2 (large improvement), 3 (moderate improvement), 4 (slight improvement), and 5 (does not apply to me). At 1 year of follow-up, patients were asked to assess how they perceived the status of their SA using the same 5-point Likert scale. They were not reminded of their preoperative responses at the time of follow-up.

The Hip disability and Osteoarthritis Outcome Score (HOOS) was used to assess hip-related functional status<sup>29</sup>. The Short Form-12 (SF-12)<sup>30</sup>, the EuroQoL-5 Dimensions (EQ-5D), and the EQ-5D VAS (visual analog scale) were used to assess general health status<sup>31</sup>. Preoperative comorbidity information

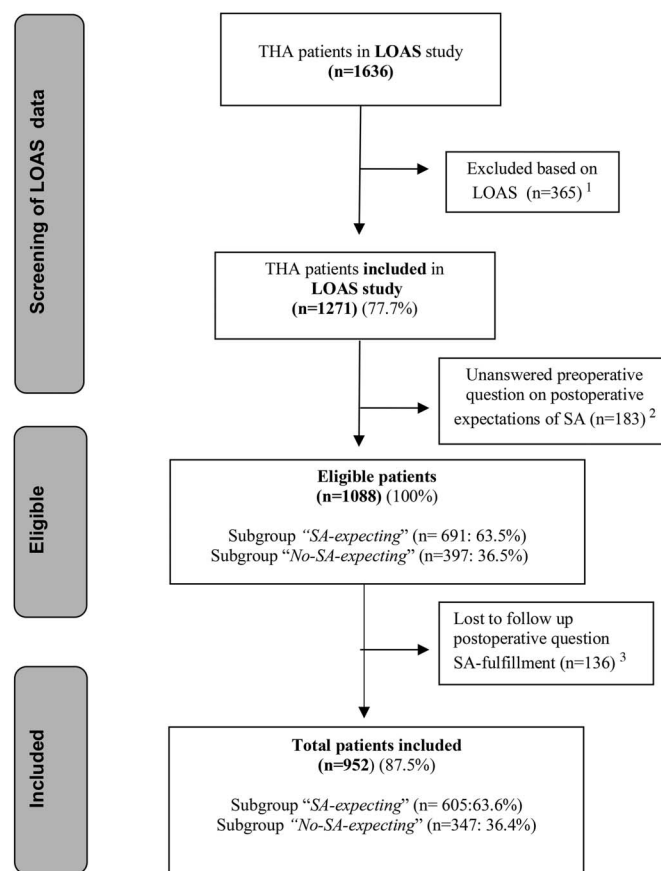


Fig. 1

Flowchart of the study. THA = total hip arthroplasty and SA = sexual activity. The study included 2 subgroups: patients with and without postoperative expected SA (the "SA-Expecting" and "No-SA-Expecting" groups, respectively). <sup>1</sup>LOAS exclusion criteria: <18 years of age, inability to understand Dutch language, physical or mental inability to complete questionnaires, revision surgery, hemiarthroplasty, total hip arthroplasty because of tumor or rheumatoid arthritis, or inability or unwillingness to provide informed consent. <sup>2</sup>Exclusion criterion: no answer in response to preoperative HSS question on SA expectations. <sup>3</sup>Exclusion criterion: no answer in response to postoperative HSS question on SA fulfillment.

TABLE 1 Preoperative Patient Characteristics\*

Characteristic	"SA-Expecting" Group	"No-SA-Expecting" Group	P Value†
Female sex (no. of patients)	348 (57.5%) of 605	252 (72.6%) of 347	0.001
Age‡ (yr)	65.2 ± 9.2 (n = 605)	72.7 ± 8.2 (n = 347)	<0.001
Age group (no. of patients)			<0.001
≤60 yr	160 (26.4%) of 605	25 (7.2%) of 347	
61-65 yr	129 (21.3%) of 605	42 (12.1%) of 347	
66-70 yr	147 (24.3%) of 605	61 (17.6%) of 347	
71-75 yr	99 (16.4%) of 605	78 (22.5%) of 347	
≥76 yr	70 (11.6%) of 605	141 (40.6%) of 347	
BMI‡ (kg/m <sup>2</sup> )	27.0 ± 4.3 (n = 594)	27.2 ± 4.4 (n = 334)	0.701
Living status (no. of patients)			0.698
Alone or with children	152 (25.5%) of 597	80 (23.3%) of 344	
With partner, with or without children	443 (74.2%) of 597	264 (76.7%) of 344	
Other (e.g., nursing home)	2 (0.3%) of 597	0 (0.0%) of 344	
HOOS‡§			
Activities of daily living	38.5 ± 18.8 (n = 573)	43.3 ± 21.4# (n = 316)	0.001
Pain	36.2 ± 17.6 (n = 585)	41.9 ± 20.6# (n = 317)	<0.001
Quality of life	32.5 ± 10.3 (n = 596)	35.5 ± 11.1# (n = 341)	<0.001
Sport	17.7 ± 18.2 (n = 581)	19.3 ± 19.6 (n = 325)	0.212
Symptoms	38.9 ± 18.0 (n = 584)	42.2 ± 19.6# (n = 314)	0.012
SF-12 MCS‡§	55.3 ± 9.4 (n = 565)	54.6 ± 9.5 (n = 310)	0.347
SF-12 PCS‡§	31.9 ± 9.5 (n = 565)	32.5 ± 9.8 (n = 310)	0.416
EQ-5D‡§	0.59 ± 0.26 (n = 596)	0.63 ± 0.24# (n = 332)	0.018
EQ-5D VAS‡§	66.4 ± 18.2 (n = 563)	67.1 ± 18.8 (n = 315)	0.594
Comorbidities (no. of patients)			
Musculoskeletal "yes"	239 (56.4%) of 424	134 (60.1%) of 223	0.363
Non-musculoskeletal "yes"	351 (67.8%) of 518	211 (74.8%) of 282	0.037

\*SA = sexual activity, BMI = body mass index, HOOS = Hip disability and Osteoarthritis Outcome Score, SF-12 = Short Form-12 Survey, PCS = Physical Component Summary, MCS = Mental Component Summary, EQ-5D = EuroQoL-5 Dimensions (Dutch version), and VAS = visual analog score. †P values for nominal categorical variables calculated with the Pearson chi-square test; for ordinal categorical variables, with the Armitage trend test; and for continuous variables, with the independent t test. ‡The values are given as the mean and the standard deviation. §All scales ranged from 0 to 100 except the EQ-5D, which ranged from 0 to 1; lower scores indicated worse outcomes. #Clinical relevance was assessed with use of minimum clinically important differences (MCIDs) for the SF-12 (MCID = 4.5)<sup>35</sup> EQ-5D (MCID = 0.074)<sup>31</sup> and HOOS (MCID = 9.1 points)<sup>36</sup>. No MCIDs were found.

was evaluated with use of a Statistics Netherlands questionnaire<sup>32-34</sup>, which asks about the presence or absence of comorbidities in the previous year in 2 domains (musculoskeletal and non-musculoskeletal comorbidities).

### Statistical Analysis

On the basis of their responses to the SA question, patients were categorized into 2 groups: the SA-Expecting Group (including those with a score of 1 [back to normal] to 4 [slight improvement]) and the No-SA-Expecting Group (including those with a score of 5 [does not apply]). Postoperative fulfillment of SA expectations was calculated by subtracting the postoperative Likert score from the preoperative Likert score. A negative score ( $\leq -1$ ) indicated less improvement than expected and was categorized as "unfulfilled." A score of 0 indicated an outcome as expected and was labeled as "fulfilled." A positive score ( $\geq 1$ ) indicated a greater-than-expected improvement and was categorized as "exceeded." The same method was used for the No-SA-Expecting Group. A score of 0 indicated that the outcome was expected (i.e., does not apply)

and was labeled as "fulfilled." A score of  $\geq 1$  indicated a greater-than-expected improvement and was categorized as "exceeded" (i.e., the patient unexpectedly regained SA).

The analyses were stratified according to sex and age ( $\leq 60$  years, 61 to 65 years, 66 to 70 years, 71 to 75 years, and  $\geq 76$  years). For the functional status and health analyses, postoperative SA outcomes were dichotomized into 2 scales ("unfulfilled" and "fulfilled/exceeded"), with the "fulfilled" and "exceeded" groups combined because the "exceeded" group was very small (n = 53; 8.8%).

The results were analyzed with use of descriptive statistics. In matrices involving 2 categorical variables, the Pearson chi-square test was used to test differences in proportions between groups. In cases in which both categorical variables were ordinal, the Armitage trend test was used. The independent samples t test was used to test differences in the means between the 2 groups.

To assess potential selection bias due to attrition, the baseline characteristics (e.g., age, sex, BMI, living status, comorbidities, and HOOS, SF-12 Physical Component

TABLE II Patient Preoperative Expectations Regarding Postoperative Sexual Activity (SA), per Age Group and Sex

	Age Group					P Value†	Sex		P Value†
	≤60 Yr (N = 185)	61-65 Yr (N = 171)	66-70 Yr (N = 208)	71-75 Yr (N = 177)	≥76 Yr (N = 211)		Male (N = 352)	Female (N = 600)	
Preop. expectations of postop. SA* (no. of patients)						<0.001			<0.001
Back to normal (n = 457)	121 (65.4%)	101 (59.1%)	110 (52.9%)	72 (40.7%)	53 (25.1%)		203 (57.7%)	254 (42.3%)	
Large improvement (n = 87)	25 (13.5%)	13 (7.6%)	24 (11.5%)	20 (11.3%)	5 (2.4%)		31 (8.8%)	56 (9.3%)	
Moderate improvement (n = 44)	10 (5.4%)	13 (7.6%)	11 (5.3%)	6 (3.4%)	4 (1.9%)		12 (3.4%)	32 (5.3%)	
Slight improvement (n = 17)	4 (2.2%)	2 (1.2%)	2 (1.0%)	1 (0.6%)	8 (3.8%)		11 (3.1%)	6 (1.0%)	
SA does not apply (n = 347)	25 (13.5%)	42 (24.6%)	61 (29.3%)	78 (44.1%)	141 (66.8%)		95 (27.0%)	252 (42.0%)	

\*As reflected in the HSS score on SA. †P values for ordinal categorical variables calculated with the Armitage trend test.

Summary [PCS], SF-12 Mental Component Summary [MCS], and EQ-5D scores) of the included and excluded patients were analyzed and compared with use of the above tests. The same tests were used to analyze associations between preoperative and postoperative scores for functional status and health status as well as for the postoperative achieved fulfillment of SA. Binary logistic regression with forward Wald selection was used to model the probability of fulfillment for the SA-Expecting Group and the probability of regaining SA for the No-SA-Expecting Group. For the selection of covariates in the multivariate logistic regression, a univariate test was performed on sex, age, BMI, living status, HOOS total score, SF-12 MCS score, SF-12 PCS score, EQ-5D score (including EQ-5D VAS), and non-musculoskeletal and musculoskeletal comorbidities. Covariates were selected for multivariate modeling if the univariate p value was <0.10. Statistical analyses were performed with use of SPSS (version 22 for Mac/Windows; IBM). The level of significance was set at  $p < 0.05$ . Clinical relevance was established with use of minimum clinically important differences (MCIDs) for the SF-12 (MCID = 4.5)<sup>35</sup>, EQ-5D (MCID = 0.074)<sup>31</sup>, and HOOS items (MCID = 9.1 points)<sup>36</sup>.

## Results

A total of 1,636 consecutive patients were scheduled for total hip arthroplasty surgery. After screening, 1,271 respondents remained. In total, 1,008 participants (79.3%) answered the preoperative SA question. Incomplete answers on preoperative or postoperative SA were excluded, leaving 952 (74.9%) patients for analysis (Fig. 1). Comparisons of data from included and excluded patients showed no statistical differences in terms of patient characteristics and study outcomes measures.

The patients in the No-SA-Expecting group were older ( $p < 0.001$ ), were more often female ( $p = 0.001$ ), and had more non-musculoskeletal comorbidities ( $p = 0.037$ ) compared with those in the SA-Expecting Group (Table I). Although the No-SA-Expecting Group scored significantly better on HOOS-activities of daily living ( $p = 0.001$ ), HOOS-pain ( $p < 0.001$ ), HOOS-quality of life ( $p < 0.001$ ), HOOS-symptoms ( $p = 0.012$ ), and EQ-5D ( $p = 0.018$ ) (Table I), no clinically important differences were found when these scores were compared with data in the literature on MCIDs in patients undergoing total hip arthroplasty (data not shown)<sup>31,35,36</sup>.

TABLE III Fulfillment of Preoperative Sexual Activity (SA) Expectations (After 1 Year)

	Fulfillment of Preop. SA Expectations*			P Value†
	Unfulfilled	Fulfilled	Exceeded	
SA-Expecting Group‡ (n = 605)				0.002
Preop. SA expectations				
Back to normal (n = 457)	187 (40.9%)	270 (59.1%)	0 (0.0%)	
Large improvement (n = 87)	44 (51.0%)	9 (10.3%)	34 (39.1%)	
Moderate improvement (n = 44)	21 (47.7%)	9 (20.5%)	14 (31.8%)	
Slight improvement (n = 17)	11 (64.7%)	1 (5.9%)	5 (29.4%)	
Total (n = 605)	263 (43.5%)	289 (47.8%)	53 (8.8%)	
No-SA-Expecting Group (n = 347)		284 (81.8%)	63§ (18.2%)	

\*For the SA-Expecting Group, unfulfilled = lower results ( $\leq 1$  step) than expected preoperatively, fulfilled = achieved SA as expected preoperatively, and exceeded = better results ( $\geq 1$  step) than expected preoperatively. For the No-SA Expecting Group, fulfilled = SA not regained postoperatively, and exceeded = SA unexpectedly regained postoperatively. †P value for ordinal categorical variables calculated with the Armitage trend test. ‡Of the 605 patients in the SA-Expecting Group, 147 had no SA at 1 year postoperatively, including 92 (20.1%) of 457 who had expected to return to normal function, 27 (31.0%) of 87 who had expected large improvement, 17 (38.6%) of 44 who had expected moderate improvement, and 11 (64.7%) of 17 who had expected slight improvement. §Of the 63 patients in the No-SA-Expecting group who unexpectedly regained SA, 53 (84.1%) regained normal function, 4 (6.3%) reported large improvement, 3 (4.8%) reported moderate improvement, and 3 (4.8%) reported slight improvement.



Most patients expected a return to normal (457 of 605) or a large improvement in SA (87 of 605) (Table II). The expectation to return to normal was lowest among patients  $\geq 76$  years of age (25.1%;  $p < 0.001$ ) and was lower among women (42.3%) than men (57.7%). The expectation that SA would not apply after total hip arthroplasty was highest among patients  $\geq 76$  years of age (66.8%) and was higher among women (42%) than men (27.0%) ( $p < 0.001$ ) (Table II).

Of the patients with preoperative SA expectations, 47.8% saw their expectation fulfilled after 1 year. In 43.5% of patients, SA expectations were unfulfilled. Of this group, 147 (24.3%) were still sexually inactive despite most having expected a return to normal SA. In contrast, 18.2% of patients who did not expect postoperative SA in fact regained SA (mostly a return to normal SA) (Table III).

In the SA-Expecting group, unfulfilled SA expectations increased with higher age (e.g., SA expectations were unfulfilled for 36.3% of patients  $\leq 60$  years old, compared with 61.4% of those  $\geq 76$  years old). SA expectations were exceeded for nearly 10% of patients in all age groups, with the exception of those  $\geq 76$  years old (with SA expectations being exceeded for only 2.9% of patients) (see Appendix).

In the No-SA-Expecting Group, the proportion of patients who regained SA decreased with higher age, from 60% (15 of 25) among patients  $\leq 60$  years old to 7.1% (10 of 141) among those  $\geq 76$  years old. Overall, among patients  $\leq 60$  years old, we found an interaction with sex (men,  $p = 0.007$ ; women,  $p = 0.048$ ), with men being more likely to unexpectedly regain SA (38.9%; 37 of 95) than women (10.3%; 26 of 252) (see Appendix).

Joint-specific functional scores (HOOS) and overall quality-of-life scores were lower among all patients with unfulfilled SA expectations compared with patients in the SA fulfilled/exceeded group, except for HOOS-pain in the No-SA-Expecting group (Table IV). Preoperative musculoskeletal comorbidities were strongly associated with postoperative fulfillment ( $p = 0.001$ ), as were non-musculoskeletal comorbidities ( $p = 0.004$ ). As for the difference between preoperative and postoperative scores, the postoperative changes of almost all scores (HOOS domain subscores, SF-12 PCS, and EQ-5D) were greater in the group that exceeded expectations compared with the MCIDs reported in the literature<sup>31,35,36</sup> (Table IV).

Older age was inversely associated with postoperative fulfillment of SA expectations (e.g., patients  $\geq 76$  years of age versus  $\leq 60$  years of age, odds ratio and 95% confidence interval [OR and 95% CI] = 0.28 [0.13 to 0.62];  $p = 0.002$ ) (Table V). The probability of postoperative SA fulfillment was only slightly associated (4% per unit increase) with a higher (better) postoperative score for HOOS-symptoms (OR = 1.04 [1.02 to 1.06];  $p < 0.001$ ) and HOOS-sport (OR = 1.01 [1.00 to 1.03];  $p = 0.032$ ). In the No-SA-Expecting group, better postoperative HOOS-sport scores were weakly associated with a higher probability of SA fulfillment (OR = 1.02 [1.01 to 1.03];  $p < 0.001$ ). Older age decreased the likelihood of regaining SA (e.g., patients  $\geq 76$  years of age versus  $\leq 60$  years of age, OR = 0.07 [0.02 to 0.21];  $p < 0.001$ ). Given the high percentage of fulfillment, the ORs in these results do not have a relative risk interpretation.

## Discussion

One year after total hip arthroplasty, expectations regarding SA were unfulfilled in 43.5% of patients who had expected to regain SA. Of the patients without SA expectations, 18.2% reported postoperative SA, with the highest rates (approximately 60%) in patients  $\leq 60$  years of age and male patients.

Previous studies evaluating SA expectations demonstrated that 15% to 50% of patients had unfulfilled SA expectations at the time of the 1-year follow-up<sup>19,20</sup>. Poor mental health, older age, female sex, and physical disabilities have been found to be associated with decreased postoperative SA fulfillment<sup>17,20,21,37</sup>. Although previous studies had a smaller sample size, had more missing data (35% to 40%), and were more heavily skewed toward men and younger patients than our LOAS cohort study, the present study also demonstrated these findings. However, we stratified the patients into 2 subgroups: patients with and without expectations of postoperative SA. The fact that none of the other studies has classified participants in this way makes comparison impossible, especially for the achieved postoperative SA of the patients in the No-SA-Expecting Group.

Important confounders for decreased SA are older age and pain<sup>2</sup>. The importance of sexuality in older people was highlighted in a longitudinal (4-generation) cohort study in Sweden, which demonstrated that the frequency of SA among the population of individuals  $\geq 70$  years of age has increased since the turn of the millennium<sup>38</sup>. We suggest that SA is an important aspect of quality of life<sup>24</sup> and warrants attention given that sexuality is not regularly addressed in orthopaedic consultations<sup>5,15,23,39</sup>. Reported outcomes and patient expectations of postoperative outcomes are mainly determined by information provided by professionals<sup>21,22</sup>. Overall, about 25% of all patients managed with total hip arthroplasty are unsatisfied with the postoperative results<sup>19</sup>. The dissatisfaction may be associated with the absence of SA, which, in a considerable part of this group, may be reflected in patient-reported outcome measures associated with functionality.

In a retrospective telephone-call follow-up study among young ( $\leq 60$ -year-old) patients managed with total hip arthroplasty, 95% of patients were found to have regained postoperative SA and 70% reported a better quality of sex life<sup>14</sup>. The follow-up period in that study was 2.3 years; the duration of follow-up in the present study was only 1 year. Recent literature, however, has shown that patients' greatest objective functional improvement after total hip arthroplasty occurs in the first 3 months<sup>37</sup>. Other literature has shown that patients expect to be fully recovered at 6 months after total hip arthroplasty<sup>40</sup>. Consequently, there is a gap between our results (42.3% unfulfilled SA after 1 year) and the patients' expected fully recovered horizon of 6 months; this gap is concerning, particularly as unfulfilled SA after surgery may cause distress<sup>41</sup>. Consequently, it underlines the importance of addressing SA expectation management in the consultation room, not only for younger patients, but also for the population of patients  $\geq 70$  years of age<sup>38,42</sup>. Our results after 1 year provide useful additional information for arthroplasty surgeons and add to the current literature.

TABLE IV Functional and Health Status and Change According to Fulfillment of SA Expectations (After 1 Year)\*

Functional and Health Status	Preoperative Functional/Health Parameters According to Postoperative Achievement of Expectations			Postoperative Functional/Health Parameters According to Postoperative Achievement of Expectations		
	Unfulfilled†	Fulfilled/ Exceeded‡	P Value§	Unfulfilled†	Fulfilled/ Exceeded‡	P Value§
<b>SA-Expecting Group</b>						
<i>Comorbidities (no. of patients)</i>						
Musculoskeletal (n = 239/424)	109 (45.6%)	130 (54.4%)	0.001	NA	NA	
Non-musculoskeletal (n = 351/518)	161 (45.9%)	190 (54.1%)	0.004	NA	NA	
<b>HOOS**</b>						
Activities of daily living (scale 0-100)	36.5 ± 20.0	39.9 ± 17.7	0.031	75.8 ± 21.8	91.9 ± 11.0	<0.001
Pain (scale 0-100)	34.5 ± 19.0	37.4 ± 16.5	0.048	79.9 ± 22.0	92.6 ± 11.7	<0.001
Quality of life (scale 0-100)	31.9 ± 11.0	33.0 ± 9.7	0.195	52.1 ± 18.3	63.5 ± 13.0	<0.001
Sport (scale 0-100)	15.2 ± 17.6	19.3 ± 18.2	0.008	54.7 ± 29.0	76.7 ± 20.7	<0.001
Symptoms (scale 0-100)	37.0 ± 17.6	40.3 ± 18.2	0.031	70.9 ± 22.2	86.9 ± 13.5	<0.001
<b>Health status**</b>						
SF-12 PCS (scale 0-100)	30.7 ± 9.5	33.2 ± 9.6	0.003	42.0 ± 11.1	49.7 ± 8.7	<0.001
SF-12 MCS (scale 0-100)	53.7 ± 10.2	56.4 ± 8.6	0.001	54.1 ± 9.4	57.2 ± 5.9	<0.001
EQ-5D (scale 0-1)	0.56 ± 0.27	0.62 ± 0.24	0.005	0.78 ± 0.21	0.91 ± 0.13	<0.001
EQ-5D-06 (VAS scale 0-100)	63.7 ± 18.6	68.5 ± 17.7	0.002	74.4 ± 14.0	83.0 ± 11.2	<0.001
<b>No-SA-Expecting Group</b>						
<i>Comorbidities (no. of patients)</i>						
Musculoskeletal (n = 134/223)	116 (86.6%)	18 (13.4%)	0.019	NA	NA	
Non-musculoskeletal (n = 211/281)	173 (82.0%)	38 (18.0%)	0.403	NA	NA	
<b>HOOS**</b>						
Activities of daily living (scale 0-100)	42.3 ± 20.6	48.9 ± 23.3	0.028	79.2 ± 20.1	89.7 ± 15.1	<0.001
Pain (scale 0-100)	40.6 ± 20.1	48.0 ± 21.1	0.011	86.1 ± 18.6	91.9 ± 14.4	0.023
Quality of life (scale 0-100)	34.8 ± 11.2	38.6 ± 10.3	0.014	58.3 ± 17.9	64.1 ± 15.6	0.018
Sport (scale 0-100)	18.8 ± 19.6	22.6 ± 20.0	0.177	56.3 ± 29.1	74.4 ± 22.9	<0.001
Symptoms (scale 0-100)	41.4 ± 19.2	45.5 ± 20.9	0.148	75.8 ± 20.8	86.4 ± 18.1	<0.001
<b>Health status**</b>						
SF-12 PCS (scale 0-100)	31.7 ± 9.5	35.9 ± 11.6	0.006	42.9 ± 12.0	49.6 ± 9.3	<0.001
SF-12 MCS (scale 0-100)	54.4 ± 9.5	57.2 ± 7.9	0.045	54.7 ± 8.7	56.6 ± 6.4	0.144
EQ-5D (scale 0-1)	0.62 ± 0.25	0.67 ± 0.21	0.211	0.81 ± 0.20	0.90 ± 0.15	0.001
EQ-5D06 (VAS scale 0-100)	66.9 ± 18.5	69.7 ± 19.9	0.300	75.1 ± 16.8	83.9 ± 12.2	<0.001

\*SA = sexual activity, MCID = minimum clinically important difference, NA = postoperative data not available, HOOS = Hip disability and Osteoarthritis Outcome Score, SF-12 = Short Form-12, PCS = Physical Component Summary, MCS = Mental Component Summary, EQ-5D and EQ-5D = EuroQoL 5-Dimensions scales (Dutch versions), and VAS = visual analog scale. †Change: the difference between preoperative and postoperative scores; higher scores = better outcome. ‡For SA-Expecting Group, unfulfilled = lower results ( $\leq 1$  step) than expected preoperatively, fulfilled = achieved SA as expected preoperatively, exceeded = better results ( $\geq 1$  step) than expected preoperatively. For No-SA-Expecting Group, fulfilled = SA not regained postoperatively, and exceeded = SA unexpectedly regained postoperatively. §P values for ordinal categorical variables calculated with Armitage trend test; p values for continuous variables calculated with independent samples t test. #++ indicates  $>10$  above MCID norm; +/- indicates slightly under MCID norm, - indicates under MCID norm, and — indicates well below MCID norm. \*\*The values are given as the mean and the standard deviation.

The present study had 2 main strengths. First, it is a large multicenter prospective cohort study, with patient-reported outcome measures on joint-specific and quality-of-life domains, focusing on the sexual functioning of patients at all ages and of both sexes (rather than just men). Second, this study provides complete data on SA outcomes both before and after surgery (with postoperative Likert scores being subtracted from preoperative scores). Third, the response rate for the present study was

very high (74.9%), probably because the “sensitive” question on SA was asked alongside other questions on expectations of postoperative outcomes (e.g., activities of daily living, recreation, and sport), with the same answer options.

The present study also had some limitations. First, some patients may have found the SA answer options to be under-defined, although we suggest that most patients likely interpreted the option “back to normal” as a “return to

TABLE IV (continued)

Change Between Preoperative and Postoperative Parameters†				
Unfulfilled‡	Fulfilled/ Exceeded‡	P Value§	Δ	Relative to MCID#
NA	NA	NA	NA	
NA	NA	NA	NA	
39.3 ± 23.6	52.0 ± 19.2	<0.001	12.7	++
45.4 ± 23.6	55.2 ± 19.2	<0.001	9.8	+/-
20.2 ± 18.3	30.5 ± 14.8	<0.001	10.3	++
39.5 ± 28.0	57.4 ± 25.1	<0.001	17.9	++
33.8 ± 23.0	46.6 ± 21.4	<0.001	12.7	++
11.4 ± 10.1	16.3 ± 10.9	<0.001	4.9	+
0.2 ± 10.6	0.9 ± 8.7	0.420	0.7	
0.23 ± 0.28	0.30 ± 0.24	0.002	0.07	+/-
10.8 ± 19.3	14.3 ± 17.3	0.026	3.5	
Fulfilled‡	Exceeded‡	P Value§	Δ	Relative to MCID#
NA	NA	NA	NA	
NA	NA	NA	NA	
36.9 ± 23.1	40.8 ± 22.4	0.232	3.9	-
45.5 ± 24.3	43.9 ± 21.3	0.637	-1.6	—
23.5 ± 19.2	25.5 ± 16.3	0.442	2.0	++
37.6 ± 30.6	51.8 ± 24.5	0.001	14.2	++
34.4 ± 24.6	40.9 ± 23.3	0.062	6.5	+/-
11.6 ± 11.2	14.1 ± 11.6	0.146	2.5	—
0.23 ± 10.2	-0.63 ± 7.6	0.561	-0.86	
0.19 ± 0.25	0.23 ± 0.21	0.188	0.04	—
7.8 ± 17.0	13.9 ± 17.2	0.017	6.1	

preoperative levels,” as it was intended (i.e., a return to what the patients consider to be normal for them). Second, this study is based on patients’ (subjective) perspectives on the topic of SA, but so too are most studies on patient-reported outcomes. Third, the HSS questionnaire was primarily developed and validated for preoperative use in the United States<sup>17,28</sup>; it was later validated for use worldwide<sup>43,44</sup>, including for preoperative and postoperative use in the Netherlands<sup>27</sup>. As with other translated and validated questionnaires, there may be some interpretation difficulties and thus issues with external validity, construct validity, and generalizability. The HSS questionnaire provides reliable information on functional status, which aids in clinical evaluation. However, as SA is multidimensional<sup>24,45</sup>, further methodologically rigorous research is necessary to thoroughly investigate sexual issues in patients undergoing total hip arthroplasty.

Two-thirds of the total hip arthroplasty population studied here had an expectation of postoperative SA. Of the 605 patients who expected to engage in SA after surgery, 43.5% reported that those expectations were unfulfilled and 24.3% were still sexually inactive at 1 year despite having expected a return to normal SA. In contrast, nearly 20% of patients who did not expect postoperative SA in fact regained SA. A return to normal SA was more common among patients who were younger and who were in the No-SA-Expecting group. Older age was associated with a lower likelihood of regaining SA and of postoperative SA fulfillment. Patients with unfulfilled postoperative SA expectations might have had unrealistic expectations at the preoperative stage. Clinicians should consider taking SA into account as a primary outcome of total hip arthroplasty and should inform patients (particularly older patients) to

TABLE V Associations with Postoperative SA Fulfillment of Both Subgroups (Multivariate Analysis)\*

Variables Associated with SA Fulfillment	Odds Ratio (95% CI)	$\beta \pm SE$	P Value
<b>SA-Expecting Group</b>			
Constant		-2.84 $\pm$ 0.60	
Preoperative musculoskeletal comorbidities "yes"	0.69 (0.43-1.10)	-0.38 $\pm$ 0.24	0.12
Age groups			0.005
$\leq$ 60 yr	1.0		
61-65 yr	0.98 (0.50-1.93)	-0.022 $\pm$ 0.35	0.951
66-70 yr	0.89 (0.47-1.70)	-0.11 $\pm$ 0.33	0.728
71-75 yr	0.43 (0.21-0.87)	-0.85 $\pm$ 0.36	0.018
$\geq$ 76 yr	0.28 (0.13-0.62)	-1.26 $\pm$ 0.40	0.002
Postoperative H00S-symptoms (scale 0-100 $\dagger$ ), per unit increase	1.04 (1.02-1.06)	0.037 $\pm$ 0.009	<0.001
Postoperative H00S-sport (scale 0-100 $\dagger$ ), per unit increase	1.01 (1.00-1.03)	0.013 $\pm$ 0.006	0.032
<b>No-SA-Expecting Group</b>			
Constant		-1.29 $\pm$ 0.62	
Age groups			<0.001
$\leq$ 60 yr	1.0		
61-65 yr	0.31 (0.10-0.93)	-1.19 $\pm$ 0.57	0.037
66-70 yr	0.16 (0.06-0.46)	-1.84 $\pm$ 0.54	0.001
71-75 yr	0.20 (0.07-0.54)	-1.64 $\pm$ 0.52	0.002
$\geq$ 76 yr	0.07 (0.02-0.21)	-2.64 $\pm$ 0.55	<0.001
Postoperative H00S-sport (scale 0-100 $\dagger$ ), per unit increase	1.02 (1.01-1.03)	0.023 $\pm$ 0.006	<0.001

\*SA = sexual activity, CI = confidence interval,  $\beta$  = beta regression coefficient, SE = standard error, and H00S = Hip disability and Osteoarthritis Outcome Score.  $\dagger$ Higher score = better outcome.

develop realistic expectations regarding postoperative sexual functioning.

## Appendix

**eA** Tables showing (1) postoperative SA outcomes according to preoperative patient expectations by age and sex and (2) the interaction between age group and sex are available with the online version of this article as a data supplement at [jbjs.org](http://links.lww.com/JBJSOA/A66) (<http://links.lww.com/JBJSOA/A66>). ■

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## Update

This article was updated on November 6, 2018, because of a previous error. On pages 6 and 7, in Table IV, the column headers were incorrectly formatted. In the row corresponding with the "SA-Expecting Group," the expectation categories now read "Unfulfilled‡" and "Fulfilled/Exceeded‡". In the row corresponding with the "No-SA-Expecting Group," the expectation categories now read "Fulfilled‡" and "Exceeded‡".

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