

ORIGINAL RESEARCH

## Resuming Sports and Leisure Activities after a Total Knee Replacement Is Influenced By a Number of Factors

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### ABSTRACT

**Background:** The number of patients who undergo total knee replacements (TKR) is on the rise, and with that rise comes higher patient expectations and higher functional needs. As a result of the declining average age at which orthopaedic surgeons may recommend TKR, patients frequently have the expectation that they will be able to return to sport (RTS) after TKR. The purpose of this research was to investigate the mid-term RTS, satisfaction level, forgotten joint level, and recreational activities after total knee replacement surgery (TKR).

**Materials and Methods:** 536 TKR (same implant design, same procedure) were performed in our centre between June 2020 and June 2022. The survey sample had a mean age of 69 years and a mean follow-up of 43 months. We called every patient who hadn't followed up in the previous six months. The analysis of 443 TKR was completed. The University of California Los Angeles Scale (UCLA), Forgotten Joint Score (FJS), and Satisfaction Score were used to evaluate RTS.

**Results:** 85% of the patients in this study experienced RTS following TKR, with a mean UCLA score rising from 4.48 to 5.92 and a high level of patient satisfaction. 93% of patients reported being satisfied or extremely satisfied with their level of activity. Higher preoperative UCLA scores and lower American Society of Anesthesiologists scores are associated with greater importance of the RTS. Each additional point in the ASA score results in a 52% lower chance of experiencing RTS.

**Conclusion:** With such a high happiness score, it was anticipated that RTS and recreational activities would come following TKR. Condition and activity levels prior to surgery are the two most important criteria in determining the likelihood of RTS. The evidence level for this type of study is a level IV retrospective case series.

**Keywords:** Complete knee replacement, sports participation, leisure pursuits, and patient satisfaction.

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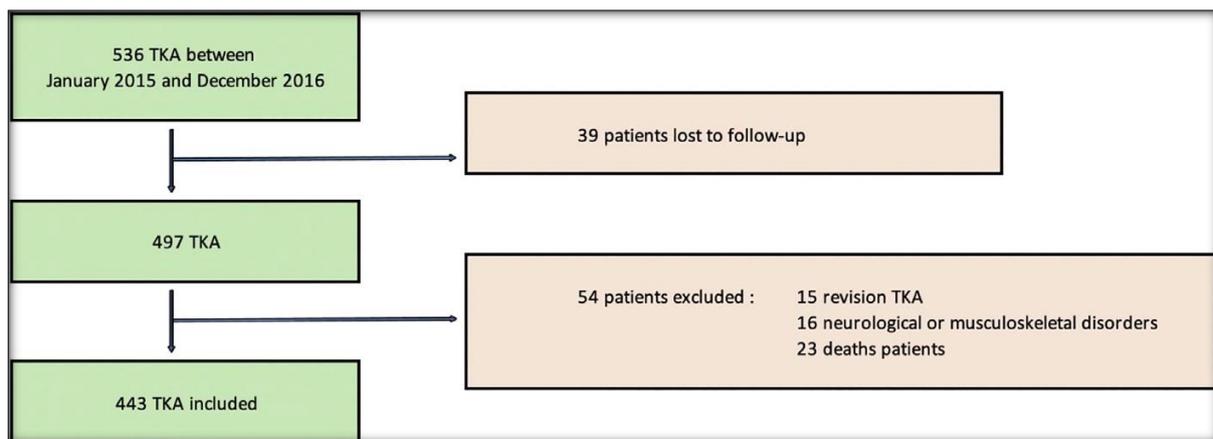
### INTRODUCTION

Demographic predictions indicate that the number of osteoarthritis (OA) patients and hence the need for total knee replacements (TKR) would rise sharply in the coming years.<sup>[1,2]</sup> This rise is due to a number of factors, including an improved life expectancy, a rise in obesity,

and a younger patient population with knee OA brought on by trauma or other factors. The younger generation frequently assumes that they can continue an active lifestyle free from discomfort or stiffness.<sup>[3-6]</sup>

The capacity to accomplish daily tasks, work, and engage in recreational activities was hampered by OA. Pain and restricted motion cause physical deconditioning, which increases the risk of being overweight and developing cardiovascular diseases as well as reducing endurance and aerobic capacity.<sup>[7-10]</sup> According to Ravi et al., the treatment of knee OA with arthroplasty may aid in the prevention of cardiovascular disease. Additionally, TKR is an affordable surgical procedure, particularly for young, active patients. TKR helps individuals with advanced knee OA function better. Even though there is proof that TKR patients can resume their active lifestyles in full, many orthopaedic surgeons still prefer to propose postoperatively only a few sports.<sup>[11-15]</sup>

In fact, pain relief is frequently insufficient for young, demanding patients with OA who desire to resume their pre-arthritic level of athletic activity. Following TKR, these patients' goals extend beyond just pain reduction. Younger patients with higher sporting expectations after TKR are now candidates for TKR thanks to cutting-edge surgical procedures and more anatomical implants. Predicting each individual patient's level of postoperative athletic participation is becoming increasingly crucial today. In particular, satisfaction depends on pre-operative expectations, which are connected with objective results, according to research by Bullens et al. and Nobel et al. that contrasted subjective and objective outcomes following TKR.<sup>[16-21]</sup>



**Figure1: Flow chart of the study (RTKR: revision TKR)**

This study set out to identify preoperative factors associated with better functional outcomes following TKR, as well as to analyse the mid-term return to sport (RTS) and recreational activities, satisfaction level, and forgotten joint level. It also sought to determine whether these factors could enable patients to receive better preoperative information regarding RTS and anticipated activities following TKR.<sup>[22-25]</sup>

## **MATERIALS & METHODS**

This retrospective study included 536 patients who underwent TKR between June 2020 and June 2022. The same primary high flexion posterior-stabilized cemented implant was used during surgery. Four senior surgeons each performed a TKR without a tourniquet using the same surgical approach. For valgus knees, the Keblish lateral approach was used, and for varus knees, a medial parapatellar trans-quadricipital approach was used. Only in cases of severe patellar osteoarthritis was the patella resurfaced. All patients underwent immediate full-weight-bearing rehabilitation and received postoperative thromboembolic prophylaxis for

30 days. The primary TKR for symptomatic knee osteoarthritis was the inclusion criterion. Throughout the period of June 2020 to June 2022, 536 TKRs were completed. Revision TKR, inflammatory osteoarthritis, neuromuscular conditions (Parkinson's disease, Alzheimer's disease, stroke), and conditions that might obstruct the typical postoperative rehabilitation protocol were the exclusion criteria. We cut out 16 patients with neurological or musculoskeletal conditions, 15 revision TKRs, and 23 deaths at the end of the final follow-up. A functional questionnaire was used to assess all patients who had not received clinical follow-up in the previous six months. In the end, 39 patients (7%) were not followed up on. A total of 443 TKR were analysed in the study. Figure 1 displays a patient flowchart, and Table 1 provides a summary of demographic data. In this study, the mean follow-up period was 43 months (range: 23–49 months). Patients answered the questions after two months, one year, and every two years after surgery. Prior to surgery, the UCLA score and sport category were used to determine the patient's degree of activity. Calls were made to all patients who did not have in-person consultations in 2019. We looked at the low, moderate, and high activity levels in the postoperative UCLA score. RTS after surgery (measured in months), the most popular sport after surgery, the forgotten joint score (FJS), and a satisfaction score based on the new IKS score (very satisfied, satisfied, disappointed, and dissatisfied) were also gathered in the study.

### **Statistical analysis:**

For continuous variables, means and standard deviations, medians and ranges, and percentage counts for categorical variables were used to summarise patient demographics. According to sex and age, the study sample was separated into four subgroups: younger group (age < 65 yo) and older group (age > 65 yo). Sport levels both before and after surgery, RTS, FJS, and degree of satisfaction were compared between groups. ASA score, sex, preoperative UCLA group (low, moderate, or high), type of deformity (neutral, varus, or valgus alignment groups), degree of deformity, and patellar resurfacing were all taken into consideration when determining potential correlations between return to sport and these factors. For the multivariate analysis, we employed a generalised binomial linear logistic model created with R Commander.

## **RESULTS**

### **Return to sport:**

After TKR, a total of 376 patients (85%), including 240 women (85%) and 136 males (84%), went back to their sport. This amounts to 88% of patients in the 65 and older age group (129 individuals) and 83% of patients overall. The median time from surgery to RTS was 5 months (range, 1–36 months), with 33% of patients participating in sports or other activities during the first three months after surgery and 81% within the first six months.

### **Predictive factors to RTS:**

According on preoperative UCLA scores, there is a significant difference in return to sport (multivariate analysis,  $p < 0.001$ ). RTS rates were higher in patients with higher preoperative UCLA scores. Higher ASA scores were a poor predictor of RTS ( $p < 0.005$ ), with each additional point in ASA translating to a 52% decrease in the likelihood of RTS. Age, sex, BMI ( $p = 0.054$ ), the degree of preoperative knee deformity, the history of prior knee surgery, and patellar resurfacing did not differ significantly from one another.

### **Level of activity: UCLA**

Three groups were created based on patients' levels of activity: those with low activity (UCLA scale 3), those with moderate activity (UCLA scale 4-6), and those with high activity

(UCLA scale 7); patients were also separated into two groups based on gender and age range: those under 65 and those over 65. The average UCLA score was 4.45 before surgery and 5.92 after, representing a 1.47 point increase in activity level. After surgery, the UCLA scores of 357 patients (80%) were significantly higher, those of 64 patients (14%) were the same, and those of 22 patients (5%) were lower than their pre-op scores. Only 67 patients reported limitations in their daily routines as a result of their TKR, whereas 82% reported being RTS or participating in leisure activities after surgery.

### **Satisfaction and forgotten joint score (FJS):**

The post-TKR satisfaction rate at the most recent follow-up was crucial. Four hundred and twelve patients (or 93%) said they were satisfied or very satisfied with the service they received, while seventeen (or 4%) were satisfied to a lesser extent and fifteen (3%) were not satisfied at all. Patients who were dissatisfied had a lower FJS level, at 25/100, and only 12 patients ultimately resumed athletic participation. As many as 344 patients (77%) reported a FJS of 75 or higher, were unrestricted in their ability to engage in physical activity, and reported a level of satisfaction of 38 or higher. Postoperative happiness did not differ significantly by either sex or age group.

**Table1: Sample character is tics and outcomes**

<b>Age(years)Age&lt;65yoAge&gt;65yo</b>	<b>69(41–90)</b>
<b>Gender</b>	<b>146(41–65)</b> <b>297(66–90)</b>
Male	162(36.6%)
Female	281(63.4%)
BMI Knee surgery before	29.3(19–46)
Medial meniscectomy	58(13%)
Articular washing	38(8.5%)
HTO	32(7%)
ACL ligamentoplasty	27(6%)
Lateral meniscectomy	24(5.5%)
Tibial plate fracture	10(2.2%)
Temporal fracture	4(1%)
DFO	1(0.2%)
Varus deformity	311(70%)
Valgus deformity	87(20%)
Normoaxis	45(10%)
IKSobjective	47
UCLA<4	119(27%)
UCLA4–6	289(65%)
UCLA>6	35(8%)

### **Sport disciplines:**

Walking, hiking, gardening, swimming, yoga, cycling, and playing golf were the most common actions. 376 people said they participated in sports, and 326 people (86.9%) said they advanced to a higher level. In comparison to preoperative levels, 39 patients (10.3%) reported being at the same level, whereas 11 patients (3%), were at a lower level. We discovered a shift away from high-impact sports like tennis, jogging, or skiing, and toward low-impact ones like walking, hiking, cycling, and swimming. Those who have reduced their athletic activity have mentioned factors including a desire to protect their TKR (9 patients),

knee discomfort (7 patients), an overall poor state of health (2 patients), a perception of knee instability (2 patients), or periprosthetic infection (2 patients).

**Table2: Variation in types of sport practiced**

Activity	Preoperative	Postoperative
Walking	208(46.9%)	263(59.3%)
Cycling	106(23.9%)	120(27.0%)
Swimming	47(10.6%)	56(12.6%)
Gardening	50(11.3%)	55(12.4%)
Hiking	48(10.8%)	54(12.2%)
Fitness/yoga	26(5.8%)	32(7.2%)
Skiing	28(6.3%)	23(5.2%)
Golf	11(2.4%)	9(2.0%)
Petanque	6(1.3%)	6(1.3%)
Fishing/hunting	4(0.9%)	5(1.2%)
Tennis	5(1.2%)	3(0.7%)
Dancing	0	2(0.5%)
Running	4(0.9%)	1(0.3%)
Climbing	1(0.3%)	1(0.3%)

#### **Range of motion evolution:**

We looked into whether or not a correlation exists between a patient's ROM and their level of contentment. Patients' range of motion reduced following TKR throughout the board, from 117 degrees for those who were dissatisfied to 109 degrees for those who were low-satisfied, from 122 degrees for those who were satisfied to 114 degrees, and from 125 degrees for those who were satisfied. After TKR, only the most content patients saw their range of motion increase from 120 degrees to 122 degrees.

#### **Complications:**

There were eight total knee replacement (TKR) revision surgeries: two for aseptic loosening, three for prosthetic joint infection (PJI), two for lateral patellar instability, and one for patellar clunk syndrome. Of the eight individuals who needed revision surgery, half were already back in the game before their initial procedure.

#### **DISCUSSION**

Most patients in this study returned to sports within 6 months after surgery (80%), and their UCLA scores improved significantly from pre- to post-operative levels. Therefore, patients can anticipate returning to sports after TKR. It has been shown that preoperative UCLA and ASA scores are the most accurate predictors of RTS after TKR, while age, gender, and body mass index (BMI) do not appear to influence the RTS, in contrast to other published studies.<sup>[15,16,20]</sup> Although patients continued to engage in a similar number of sports both before and after surgery, the types of sports they played shifted. Although this was not the first study to examine the RTS after TKR, it is the largest and longest-term follow-up of its kind. The series was compared to ten other studies. There were more than 100 patients analysed in these studies, and their mean follow-up was more than a year. Seventy-seven percent of pre-operative athletes reported returning to their sport, with or without modifications, according to a study by Bradbury et al. Chatterji et al. found that after a year, 75% of patients were able to return to their previous level of athletic performance. The mean postoperative UCLA score was similar to that reported by Bauman et al. (n=184 TKR) who

reported a mean score of 6.0. Seventy-four percent of patients were active 5.7 years after arthroplasty, with a mean score of 7.1; however, sixteen percent of patients reported engaging in heavy manual labour or sports that were "not recommended" by the Knee Society survey.<sup>[26,27]</sup>

Results from studies by Chatterji et al. and Wylde et al. show that after TKR, patients engage in fewer high-impact activities like jogging, skiing, or tennis and more low-impact ones like walking, hiking, cycling, or swimming. Witjes et al. conducted a systematic review and found that the RTS for TKR ranged from 36% to 89%, with a mean total of 0.2-1.0 sports at 13 weeks.<sup>[27]</sup>

Extreme sports do not increase the risk of implant loosening, bearing surface wear, or early revision. Despite the advice of some surgeons, Mont et al. found that professional tennis players could return to their sport following TKR. Healy et al. noted that there was insufficient evidence to provide recommendations on implant survival after sport, so patients were advised to refrain from participating in high-impact activities. Among our research population, 147 (35.7%) were active participants in high-impact sports without implant failure.<sup>[28]</sup> Therefore, surgeons shouldn't dissuade patients from returning to sport if they've informed themselves about the hazards and still want to participate. Research by Kersten et al. found that nearly half of TKR patients did not engage in health-promoting physical activity. Patients who had lateral unicompartamental knee replacements (UKR) in a research by Walker et al. tended to engage in fewer physically demanding pursuits after surgery. Only 22 of our TKR patients experienced activity limitations as a result of their procedure due to discomfort, knee instability, or restricted range of motion. UKR was reported to have better outcomes than TKR in a study by Hopper and Leach, who also showed that patients who underwent TKR were able to return to low-impact sports. With TKR, 63.4% of patients resumed their sports activities within 4.1 months, with a notable drop in bowling and golf participation. Mallon and Callaghan discovered that regular golfers' handicaps increased and their driving distance decreased. Midway through the follow-up period, Jones et al. found no evidence of an uptick in revision rates attributable to high-impact activities. Patients' preoperative expectations have been proven by Bonnin et al. to have a significant impact on their level of satisfaction. Our survey found that 92% of patients were either satisfied or overjoyed with their experience, with a mean Forgotten Joint Score of 82/100. This corroborates the findings of earlier research that show TKR improves patients' quality of life.

## CONCLUSION

A number of caveats apply to this study. As a preliminary matter, this is a historical investigation; hence the quality of evidence is low. Second, 7% of patients were not traceable, making it impossible to know whether or not they had died or undergone subsequent surgical procedures. Just 65% of people answered the door in a similar study by Chang et al. Finally, the average follow-up time in this study was 43 months, which is long enough to assess early satisfaction outcomes, activity levels, and time to RTS but not long enough to assess revision rates, wear, or loosening. With a high likelihood of functional improvement and RTS following TKR, total knee arthroplasty is an excellent procedure for relieving pain. The best predictors of RTS are the patient's health and level of exercise before surgery. Patients should be encouraged to continue physical activities after TKR, with modifications made based on their overall health, their activity level before surgery, and the type of sport they participated in before surgery. The surgeon should then inform the patient of the range of motion they can expect to regain after TKR, as well as any necessary adjustments to their daily routine, and provide additional information regarding the anticipated outcome, taking into account the patient's preoperative health and physical condition.

**REFERENCES**

1. Wunderlich, F., Eckhard, L., Büttner, M., Lange, T., Konradi, J., Betz, U., &Lützner, J. (2022). The INDICATE Knee expectations survey detects general patient treatment goals for total knee arthroplasty and the influence of demographic factors on patients expectations. *Knee Surgery, Sports Traumatology, Arthroscopy*, 1-13.
2. Straat, A. C., Denise, J. M., Coenen, P., Kerkhoffs, G. M., Anema, J. R., &Kuijer, P. P. F. (2022). Large variability in recommendations for return to daily life activities after knee arthroplasty among Dutch hospitals and clinics: a cross-sectional study. *Acta Orthopaedica*, 93, 568.
3. Kawano, T., Nankaku, M., Murao, M., Goto, K., Kuroda, Y., Kawai, T., ...& Matsuda, S. (2022). Development of a clinical prediction rule to identify physical activity after total hip arthroplasty. *Archives of Physical Medicine and Rehabilitation*.
4. Latijnhouwers, D. A., Niels, L. A. A. S., Verdegaal, S. H., Nelissen, R. G., Vlieland, T. P. V., Kaptijn, H. H., &Gademan, M. G. (2022). Activities and participation after primary total hip arthroplasty; posterolateral versus direct anterior approach in 860 patients. *Acta Orthopaedica*, 93, 613.
5. Mead, P. A., &Bugbee, W. D. (2022). Direct Anterior Approach to Total Hip Arthroplasty Improves the Likelihood of Return to Previous Recreational Activities Compared with Posterior Approach. *JAAOS Global Research & Reviews*, 6(1).
6. Cowie, J. G., Turnball, G. S., Ker, A. M., &Breusch, S. J. (2013). Return to work and sports after total hip replacement. *Archives of orthopaedic and trauma surgery*, 133(5), 695-700.
7. Ollivier, M., Frey, S., Parratte, S., Flecher, X., &Argenson, J. N. (2012). Does impact sport activity influence total hip arthroplasty durability?. *Clinical Orthopaedics and Related Research*®, 470(11), 3060-3066.
8. Kuster, M. S. (2002). Exercise recommendations after total joint replacement. *Sports medicine*, 32(7), 433-445.
9. Witjes, S., Gouttebauge, V., Kuijer, P. P. F. M., van Geenen, R. C., Poolman, R. W., &Kerkhoffs, G. M. (2016). Return to sports and physical activity after total and unicondylar knee arthroplasty: a systematic review and meta-analysis. *Sports Medicine*, 46(2), 269-292.
10. Pestka, J. M., Feucht, M. J., Porichis, S., Bode, G., Südkamp, N. P., & Niemeyer, P. (2016). Return to sports activity and work after autologous chondrocyte implantation of the knee: which factors influence outcomes?. *The American Journal of Sports Medicine*, 44(2), 370-377.
11. Seyler, T. M., Mont, M. A., Ragland, P. S., Kachwala, M. M., &Delanois, R. E. (2006). Sports activity after total hip and knee arthroplasty. *Sports Medicine*, 36(7), 571-583.
12. Wylde, V., Blom, A., Dieppe, P., Hewlett, S., & Learmonth, I. (2008). Return to sport after joint replacement. *The Journal of bone and joint surgery. British volume*, 90(7), 920-923.
13. Dubs, L., Gschwend, N., &Munzinger, U. (1983). Sport after total hip arthroplasty. *Archives of orthopaedic and traumatic Surgery*, 101(3), 161-169.
14. Healy, W. L., Iorio, R., &Lemos, M. J. (2000). Athletic activity after total knee arthroplasty. *Clinical Orthopaedics and Related Research (1976-2007)*, 380, 65-71.
15. Casartelli, N. C., Leunig, M., Maffiuletti, N. A., &Bizzini, M. (2015). Return to sport after hip surgery for femoroacetabular impingement: a systematic review. *British journal of sports medicine*, 49(12), 819-824.
16. Vogel, L. A., Carotenuto, G., Basti, J. J., & Levine, W. N. (2011). Physical activity after total joint arthroplasty. *Sports health*, 3(5), 441-450.

17. Healy, W. L., Iorio, R., &Lemos, M. J. (2001). Athletic activity after joint replacement. *The American journal of sports medicine*, 29(3), 377-388.
18. McGrory, B. J., Stuart, M. J., & Sim, F. H. (1995, April). Participation in sports after hip and knee arthroplasty: review of literature and survey of surgeon preferences. In *Mayo Clinic Proceedings* (Vol. 70, No. 4, pp. 342-348). Elsevier.
19. Meira, E. P., &Zeni, J. (2014). Sports participation following total hip arthroplasty. *International journal of sports physical therapy*, 9(6), 839.
20. Naal, F. D., Fischer, M., Preuss, A., Goldhahn, J., von Knoch, F., Preiss, S., ...&Drobny, T. (2007). Return to sports and recreational activity after unicompartmental knee arthroplasty. *The American journal of sports medicine*, 35(10), 1688-1695.
21. Bradbury, N., Borton, D., Spoo, G., & Cross, M. J. (1998). Participation in sports after total knee replacement. *The American journal of sports medicine*, 26(4), 530-535.
22. Golant, A., Christoforou, D. C., Slover, J. D., & Zuckerman, J. D. (2010). Athletic participation after hip and knee arthroplasty. *Bull NYU HospJt Dis*, 68(2), 76-83.
23. Mancuso, C. A., Salvati, E. A., Johanson, N. A., Peterson, M. G., &Charlson, M. E. (1997). Patients' expectations and satisfaction with total hip arthroplasty. *The Journal of arthroplasty*, 12(4), 387-396.
24. Schumann, K., Flury, M. P., Schwyzer, H. K., Simmen, B. R., Drerup, S., &Goldhahn, J. (2010). Sports activity after anatomical total shoulder arthroplasty. *The American Journal of Sports Medicine*, 38(10), 2097-2105.
25. Leichtenberg, C. S., Tilbury, C., Kuijer, P. P. F. M., Verdegaal, S. H. M., Wolterbeek, R., Nelissen, R. G. H. H., ... & Vliet Vlieland, T. P. M. (2016). Determinants of return to work 12 months after total hip and knee arthroplasty. *The Annals of The Royal College of Surgeons of England*, 98(6), 387-395.
26. Hoorntje, A., Janssen, K. Y., Bolder, S. B., Koenraadt, K. L., Daams, J. G., Blankevoort, L., ... &Kuijer, P. P. F. M. (2018). The effect of total hip arthroplasty on sports and work participation: a systematic review and meta-analysis. *Sports Medicine*, 48(7), 1695-1726.
27. Jones, D. L. (2011). A public health perspective on physical activity after total hip or knee arthroplasty for osteoarthritis. *The Physician and sportsmedicine*, 39(4), 70-79.
28. Papalia, R., Del Buono, A., Zampogna, B., Maffulli, N., &Denaro, V. (2012). Sport activity following joint arthroplasty: a systematic review. *British medical bulletin*, 101(1), 81.