

Should patient activity be restricted after total hip, total knee or unicondylar knee arthroplasty?

Mehmet Kürşat Yılmaz (Presneter), MD, Ji Baochao, MD, Niyazi Cakır, MD, Alparslan Uzun, MD, Azlina Amir Abbas, MD, Brian Culp, MD, Roger Torga-Spak, MD, Ibrahim Azboy, MD

Response/Recommendation: We recommend no specific activity restrictions following total joint or unicondylar arthroplasty.

Level of Evidence: Moderate

Rationale: The appropriate activity restrictions following primary total knee arthroplasty (TKA) have long been a subject of considerable debate. Traditionally, patients are informed that they can safely resume low-to-intermediate impact sports, such as cycling, walking, swimming, and golf within a period of 3 to 6 months post-surgery, without incurring a risk of complications. Conversely, they are cautioned against engaging in high-impact sports and are advised to completely avoid high-contact athletic activities, as these may pose significant risks. Studies have supported this approach, emphasizing the importance of a gradual return to physical activity while prioritizing the integrity of the surgical outcome and the overall health of the patient[1–3]. Many surgeons advise against high-impact activities due to concerns about potential adverse effects on the prosthesis and surrounding bone structures. These activities are believed to contribute to accelerated wear of the prosthetic components, increasing the risk of periprosthetic osteolysis. Additionally, there is an increased risk of implant failure, which can compromise the overall success of the total knee arthroplasty. These concerns are based on clinical observations and biomechanical principles that suggest high-impact activities place excessive stress on the prosthesis and surrounding bone[4]. Lee et al.[5] evaluated patellofemoral and tibiofemoral joint contact area, contact pressure, and kinematics in cadaveric studies using a Tekscan pressure measuring system and Microscribe. Testing was performed on intact knees and following cruciate

retaining and posterior stabilized TKA at knee flexion angles of 90°, 105°, 120°, and 135°. Three loading conditions were used to simulate squatting, double stance kneeling, and single stance kneeling. They reported that kneeling may increase the likelihood of damage to cartilage and menisci in intact knees and after TKA increases in tibiofemoral contact area and pressures may lead to polyethylene wear if performed on a chronic repetitive basis.

However, recent studies present a contrary perspective. Witjes S et al.[6] included 18 original studies concerning the extent to which patients can return to sports (RTS) and be physically active after TKA and unicondylar knee arthroplasty (UKA) as well as the time it takes. Overall RTS varied from 36 to 89% after TKA and from 75 to 100% after UKA. They found that physical activity level was higher after UKA than after TKA, but a trend towards lower-impact sports was shown after both TKA and UKA. Mean time to RTS after TKA and UKA was 13 and 12 weeks, respectively. Low- and higher-impact sports after both TKA and UKA are possible, but it is clear that more patients RTS (including higher-impact types of sports) after UKA than after TKA. Nevertheless, patients typically return to lower-impact sports after either surgery. However, the overall quality of the studies reviewed was limited, as many did not adequately address confounding factors. Lester et al.[7] similarly stated that there was a return to sports after TKA and UKA. Previous experience with the sport emerged as the most significant predictor for returning to activity. Patients tended to engage in low-impact sports like walking, cycling, golf, and swimming. Participation in moderate-impact sports, such as doubles tennis and skiing, can be considered individually, based on the patient's prior experience. There is currently a lack of long-term data regarding the risks associated with returning to high-impact sports, including potential decreases in implant survivorship.

The study by Meena et al. [8] indicates that when confounding factors are appropriately controlled, both TKA and UKA have been proven to be effective, providing comparable functional outcomes and similar improvements in sports participation.

The patient's ability to return to preoperative activity levels depends on their baseline health status, living environment, and adherence to postoperative rehabilitation guidelines. Engagement in athletic activities preoperatively emerged as the most significant predictor for returning to activity after TKA[6,7]. Patients tended to engage in low-impact sports like walking, cycling, golf, and swimming. Participation in moderate-impact sports, such as doubles tennis and skiing, can be

considered individually, based on the patient's prior experience. There is currently a lack of long-term data regarding the risks associated with returning to high-impact sports, including potential decreases in implant survivorship [7]. As Kuster et al. [11] noted, it is crucial to consider an individual's prior experience and proficiency in a particular sport when evaluating its impact on the knee joint. For instance, engaging in activities such as skiing, hiking, or tennis in a recreational manner is likely to be less detrimental to the knee joint compared to performing these activities at an endurance level. This distinction underscores the importance of the intensity and frequency of participation in these sports, suggesting that moderate, recreational involvement may mitigate potential harm to the knee joint.

Based on a survey of 120 members of the European Knee Association (EKA) aimed at developing recommendations for sports participation after TKA, certain activities are advised at different stages post-surgery [9]. In the first 6 weeks, recommended activities include walking, stair climbing, aqua fitness, and static cycling. From six to twelve weeks post-TKA, cycling on level ground and yoga are recommended in addition to the earlier activities. Beyond 12 weeks, additional recommended sports include tennis doubles, golf, fitness/weightlifting, aerobics, hiking, Nordic walking, and sailing. The only sport explicitly advised against following TKA is squash[9]. A similar survey was conducted among members of the American Association of Hip and Knee Surgeons (AAHKS) in 2009. Of the 657 members who responded to the survey, 139 were asked questions about 15 sports type. Over 80% of the surgeons indicated that swimming, walking on level ground, golf, cycling, stair climbing, and walking on uneven ground could be practiced without restriction. Conversely, approximately 80% or more advised against jogging, difficult alpine skiing, and sprint running. Interestingly, surgeons who performed a higher number of revision arthroplasties tended to be more liberal in their recommendations[10].

Recommendations for total hip arthroplasty (THA) have evolved considerably, such as the restrictions often recommended after TKA and UKA. This shift is driven by advancements in surgical techniques and implant designs, which have expanded the range of activities considered safe for patients after hip replacement surgery. The rationale for advocating the gradual reintroduction of running, jogging, and high-impact activities after THA is based in the evolving landscape of research surrounding post-operative outcomes in patients undergoing THA.

Advancements in surgical techniques and implant designs, as evidenced by studies such as Pasqualini et al.[12] and Thaler et al. [13], have contributed to a shift in recommendations towards less restrictive guidelines for RTS after THA. These advancements have improved the durability and functionality of hip implants, thereby supporting a broader spectrum of physical activities for patients. Furthermore, research by Sowers et al.[14] and Vu-Han et al. [15] demonstrated that consensus guidelines are adapting to include higher impact activities, reflecting the increased confidence in the performance of modern hip implants. This evolution in guidelines suggests that patients may safely engage in running, jogging, and similar activities post-surgery with appropriate monitoring and guidance.

Studies such as Meek et al. [16] emphasize the considerable progress made in promoting sports participation after THA, indicating a positive trend towards the acceptance of higher impact exercises in post-operative rehabilitation protocols. As reported by Oljaca et al.[17], the most recommended activities included golf and doubles tennis, and no-impact or low power sports such as swimming and bicycling were also generally allowed.

Additionally, meta-analyses conducted by Magan et al. [18] and studies by Karampinas et al.[19] and Innmann et al.[20] support the notion that athletes can achieve a RTS within a reasonable timeframe following THA, underscoring the feasibility of gradually reintroducing activities such as running and jogging in a structured rehabilitation setting. As a result, the average time to RTS ranged from 4 to 6 months [12,21,22]. Bradley et al.[23] surveyed members of the British Hip Society and found that approximately a one third of surgeons would allow RTS between 6 to 12-weeks post-surgery, whilst 44% would advise RTS after 3 month postoperatively.

Concerns for long term survivorship have also been raised for return to high demand activity. Older studies do not suggest that RTS causes increased incidence in revision or aseptic loosening[24,25]. Recent studies which may reflect more modern implants and techniques also support a low risk of revision. Lefevre et al.[26] noted 2/27 (0.07%) of THA patients returning to judo required revision for aseptic loosening within 10 years of the index surgery. Gschwend et al.[27] did show minimal increased aseptic loosening 2/30 (0.06%) of skiers and noted mild increased polyethylene wear for alpine skiers at 10 years compared to less active controls. Ollivier et al.[28] concluded a lower survivorship at 15 years for patients participating in high impact sports 80.0% vs 93.5% when compared to a low impact group.

In summary, there are no universally accepted postoperative limitations following THA, TKA, and UKA. The growing body of evidence supporting a more inclusive approach to postoperative rehabilitation after total joint replacement surgery aligns with the concept of allowing patients to gradually resume running, jogging, and high-impact activities under proper supervision and in adherence to individualized rehabilitation plans. The decision to resume preoperative activities should be individualized, based on the patient's capabilities and overall health status. It is essential to adopt strategies that minimize stress on the joint to ensure the longevity of the prosthesis and prevent complications. This tailored approach emphasizes the importance of considering each patient's unique circumstances and the nature of the activities they wish to engage in, to facilitate a safe and effective return to their daily routines. Currently, the majority of relevant studies are biomechanical investigations conducted *in vitro*, lacking sufficient clinical evidence to substantiate that the so-called "risky" activities impact the long-term outcomes of total hip arthroplasty, total knee arthroplasty and unicompartmental knee arthroplasty.

References

- [1] McGrory BJ, Stuart MJ, Sim FH. Participation in sports after hip and knee arthroplasty: review of literature and survey of surgeon preferences. *Mayo Clin Proc* 1995;70:342–8. <https://doi.org/10.4065/70.4.342>.
- [2] Healy WL, Sharma S, Schwartz B, Iorio R. Athletic activity after total joint arthroplasty. *J Bone Joint Surg Am* 2008;90:2245–52. <https://doi.org/10.2106/JBJS.H.00274>.
- [3] Hartford JM. Sports After Arthroplasty of the Knee. *Sports Medicine and Arthroscopy Review* 2003;11:149.
- [4] Harris WH. Wear and periprosthetic osteolysis: the problem. *Clin Orthop Relat Res* 2001;66–70. <https://doi.org/10.1097/00003086-200112000-00007>.
- [5] Biomechanics of Hyperflexion and Kneeling before and after Total Knee Arthroplasty - PMC n.d. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4040370/> (accessed July 11, 2024).
- [6] Witjes S, Gouttebauge V, Kuijjer PPFM, van Geenen RCI, Poolman RW, Kerkhoffs GMMJ. Return to Sports and Physical Activity After Total and Unicompartmental Knee Arthroplasty: A Systematic Review and Meta-Analysis. *Sports Med* 2016;46:269–92. <https://doi.org/10.1007/s40279-015-0421-9>.
- [7] Lester D, Barber C, Sowers CB, Cyrus JW, Vap AR, Golladay GJ, et al. Return to sport post-knee arthroplasty : an umbrella review for consensus guidelines. *Bone Jt Open* 2022;3:245–51. <https://doi.org/10.1302/2633-1462.33.BJO-2021-0187.R2>.
- [8] Meena A, Abermann E, Hoser C, Farinelli L, Hepperger C, Raj A, et al. No difference in sports participation and patient-reported functional outcomes between total knee arthroplasty and unicompartmental knee arthroplasty at minimum 2-year follow-up in a matched control study. *Knee Surg Sports Traumatol Arthrosc* 2023;31:3098–105. <https://doi.org/10.1007/s00167-022-07166-1>.

- [9] Thaler M, Khosravi I, Putzer D, Hirschmann MT, Kort N, Tandogan RN, et al. Twenty-one sports activities are recommended by the European Knee Associates (EKA) six months after total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc* 2021;29:694–709. <https://doi.org/10.1007/s00167-020-06400-y>.
- [10] Swanson EA, Schmalzried TP, Dorey FJ. Activity recommendations after total hip and knee arthroplasty: a survey of the American Association for Hip and Knee Surgeons. *J Arthroplasty* 2009;24:120–6. <https://doi.org/10.1016/j.arth.2009.05.014>.
- [11] Kuster MS, Spalinger E, Blanksby BA, Gächter A. Endurance sports after total knee replacement: a biomechanical investigation. *Med Sci Sports Exerc* 2000;32:721–4. <https://doi.org/10.1097/00005768-200004000-00001>.
- [12] Pasqualini I, Emara AK, Rullan PJ, Pan X, Simmons HL, Klika AK, et al. Return to Sports and Return to Work After Total Hip Arthroplasty: A Systematic Review and Meta-analysis. *JBJS Rev* 2023;11. <https://doi.org/10.2106/JBJS.RVW.22.00249>.
- [13] Thaler M, Khosravi I, Putzer D, Siebenrock KA, Zagra L. Return to Sports After Total Hip Arthroplasty: A Survey Among Members of the European Hip Society. *J Arthroplasty* 2021;36:1645–54. <https://doi.org/10.1016/j.arth.2020.11.009>.
- [14] Sowers CB, Carrero AC, Cyrus JW, Ross JA, Golladay GJ, Patel NK. Return to Sports After Total Hip Arthroplasty: An Umbrella Review for Consensus Guidelines. *Am J Sports Med* 2023;51:271–8. <https://doi.org/10.1177/03635465211045698>.
- [15] Vu-Han T, Hardt S, Ascherl R, Gwinner C, Perka C. Recommendations for return to sports after total hip arthroplasty are becoming less restrictive as implants improve. *Arch Orthop Trauma Surg* 2021;141:497–507. <https://doi.org/10.1007/s00402-020-03691-1>.
- [16] Meek RMD, Treacy R, Manktelow A, Timperley JA, Haddad FS. Sport after total hip arthroplasty: undoubted progress but still some unknowns. *Bone Joint J* 2020;102-B:661–3. <https://doi.org/10.1302/0301-620X.102B6.BJJ-2020-0208>.
- [17] Oljaca A, Vidakovic I, Leithner A, Bergovec M. Current knowledge in orthopaedic surgery on recommending sport activities after total hip and knee replacement. *Acta Orthop Belg* 2018;84:415–22.
- [18] Magan AA, Radhakrishnan GT, Kayani B, Ronca F, Khanduja V, Meek RMD, et al. Time for return to sport following total hip arthroplasty: a meta-analysis. *Hip Int* 2023;33:221–30. <https://doi.org/10.1177/11207000211041975>.
- [19] Karampinas PK, Papadelis EG, Vlamis JA, Basiliadis H, Pneumaticsos SG. Comparing return to sport activities after short metaphyseal femoral arthroplasty with resurfacing and big femoral head arthroplasties. *Eur J Orthop Surg Traumatol* 2017;27:617–22. <https://doi.org/10.1007/s00590-016-1897-1>.
- [20] Innmann MM, Weiss S, Andreas F, Merle C, Streit MR. Sports and physical activity after cementless total hip arthroplasty with a minimum follow-up of 10 years. *Scand J Med Sci Sports* 2016;26:550–6. <https://doi.org/10.1111/sms.12482>.
- [21] Batailler C, Rozinthe A, Mercier M, Bankhead C, Gaillard R, Lustig S. Return to Sport After Bilateral Single Stage Total Hip Arthroplasty Using the Direct Anterior Approach: A Case Control Study. *J Arthroplasty* 2019;34:2972–7. <https://doi.org/10.1016/j.arth.2019.06.054>.
- [22] Hoorntje A, Janssen KY, Bolder SBT, Koenraadt KLM, Daams JG, Blankevoort L, et al. The Effect of Total Hip Arthroplasty on Sports and Work Participation: A Systematic Review and Meta-Analysis. *Sports Med* 2018;48:1695–726. <https://doi.org/10.1007/s40279-018-0924-2>.

- [23] Bradley BM, Moul SJ, Doyle FJ, Wilson MJ. Return to Sporting Activity After Total Hip Arthroplasty-A Survey of Members of the British Hip Society. *J Arthroplasty* 2017;32:898–902. <https://doi.org/10.1016/j.arth.2016.09.019>.
- [24] Dubs L, Gschwend N, Munzinger U. Sport after total hip arthroplasty. *Arch Orthop Trauma Surg* (1978) 1983;101:161–9. <https://doi.org/10.1007/BF00436765>.
- [25] Cornell CN, Ranawat CS. Survivorship analysis of total hip replacements. Results in a series of active patients who were less than fifty-five years old. *J Bone Joint Surg Am* 1986;68:1430–4.
- [26] Lefevre N, Rousseau D, Bohu Y, Klouche S, Herman S. Return to judo after joint replacement. *Knee Surg Sports Traumatol Arthrosc* 2013;21:2889–94. <https://doi.org/10.1007/s00167-012-2064-9>.
- [27] Gschwend N, Frei T, Morscher E, Nigg B, Loehr J. Alpine and cross-country skiing after total hip replacement: 2 cohorts of 50 patients each, one active, the other inactive in skiing, followed for 5-10 years. *Acta Orthop Scand* 2000;71:243–9. <https://doi.org/10.1080/000164700317411825>.
- [28] Ollivier M, Frey S, Parratte S, Flecher X, Argenson J-N. Does impact sport activity influence total hip arthroplasty durability? *Clin Orthop Relat Res* 2012;470:3060–6. <https://doi.org/10.1007/s11999-012-2362-z>.