

KNEE AND ANKLE INJURIES IN
BASKETBALL VERSUS SOCCER
WITH A FOCUS ON CELL-BASED
THERAPIES

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Knee and Ankle Injuries in Basketball versus Soccer with a Focus on Cell-Mediated Therapies

This paper addresses the causes and prevalence of knee and ankle injuries in basketball and soccer by highlighting age-specific considerations, sport-specific risks, and gender differences. It will also cover recovery and treatment. Additionally, it examines the exciting role of cell-based treatments, including stem cell therapy and platelet-rich plasma (PRP).

Overview of Knee and Ankle Injuries

Knee and ankle injuries are frequently seen in basketball and soccer and often result in extensive recovery times and chronic health issues. Knee injuries, including anterior cruciate ligament (ACL) tears and meniscus damage, are prevalent in both sports and can affect future performance and career longevity. Ankle sprains are also frequent in both but occur more commonly in basketball due to awkward landings or sudden direction changes.

Basketball Knee and Ankle Injuries

Basketball players sustain fewer knee or ankle injuries overall than soccer players. The most frequently seen knee injuries in basketball that affect performance and the athlete's long-term health are ACL tears and meniscus injuries. Patellar tendinopathy and patellofemoral pain syndrome also occur. These knee injuries commonly result in disruptive extended absences from play ([Wang, 2024](#)).

Ankle sprain and ligament strain are the two most frequent types of ankle injury in basketball. Due to sports-specific maneuvers in basketball, ankle sprains occur more commonly than knee injuries. Ankle sprains typically result from sudden changes in direction or landing on

an opponent's foot. In the National Basketball Association (NBA) these injuries often result in an inability to play in multiple games (Tummala, 2024).

Soccer Knee and Ankle Injuries

Similarly, the most common knee injuries in soccer at all skill levels are anterior cruciate ligament (ACL) tears, and meniscus injuries, however, in soccer, medial collateral ligament (MCL) tears also occur. These injuries can negatively impact a player's career and cause long-term health consequences (Makuch, 2024).

Ankle sprains are also prevalent in soccer and account for half of all injuries (Nery et al., 2016). Direct contact with other players is the main cause of injury. Defenders are the most vulnerable position in soccer to sprain their ankles and it can occur equally during games or practice (Kolokotsios et al., 2021).

Age-Specific Considerations

Pediatric Athletes (Ages 5-18)

Growth-Related Factors

In children aged 5 to 18, periods of rapid growth, the growth plate, and the immature musculoskeletal system are often affected by injuries (Brown et al., 2019). Knee strength develops from ages 12 to 16 (Gerodimos et al., 2023). Injuries in children under the age of 10 are nonspecific and usually consist of contusions, mild sprains, and fractures, whereas adolescents experience more growth plate fractures and musculoskeletal injuries (Sharadze et al., 2023). Additional contributors to injury risk in both sports are overuse injuries and inadequate recovery times.

Sports-Specific Risks

Risk factors for basketball and soccer injuries include body mass index (BMI), age, gender, and training practices. Additional risk factors include previous injury, muscle weakness, and psychosocial factors (Kolokotsios et al., 2021). Soccer and basketball in youth have unique injury risks. Injuries in basketball result from landing on an opponent's foot, changing directions, and the biomechanics of jumping and landing (Cumps et al., 2007; Aksovic et al., 2024). A player's position also influences injury risk in basketball and soccer, with centers experiencing more injuries than forwards (Cumps et al., 2007) and defenders in soccer accounting for half of all soccer injuries (Nery et al., 2016). Other risk factors for injuries in soccer also include direct contact with other players, prior injuries, muscle weakness, and psychosocial factors (Kolokotsios et al., 2021).

Treatment

Overuse injuries can develop from repetitive stress without sufficient recovery (Brenner & Watson, 2024). The use of protective equipment, proper training programs, recovery periods, and injury prevention education are essential to promote safe, long-term sports participation (Brenner & Watson, 2024; Al-Qahtani et al., 2023). Basketball and soccer injuries are usually treated with heat and/or cold packs, therapeutic exercises, and athletic trainer evaluations (McCarthy et al., 2023). Surgical options are reserved for the most severe injuries. Additional details will follow in the Recovery and Treatment Section.

College-Aged Athletes (Ages 18-23)

Physiological Factors

Recent studies have focused on the importance of sleep and physiological factors in college athletes' health and performance. Insufficient sleep can affect cognitive function,

recovery time, growth hormone secretion, and glycogen storage (Patel et al., 2024). Inadequate sleep negatively impacts academic performance and mental health, but its effect on athletic performance and injury rates is still unclear (Wilkes et al., 2021). Physiological factors such as blood pressure, cholesterol levels, Body Mass Index (BMI), and body fat percentage in college students differ from their aged-matched peers in the general population (Black et al., 2017). College athletes demonstrate more efficient aerobic conditioning, with better vital capacity and heart rate measurements (Renfrow & Bolton, 1981). These factors may tend to minimize the risk of injury.

Sport-Specific Risks and Treatment

Recent studies address various sports-specific risks for college students aged 18-23. First-year college students are at increased risk of developing eating disorders due to increased body awareness from wearing uniforms and perceived pressure from coaches and teammates (Palermo et al., 2024). Mental health issues are also significant with 22.3% of student-athletes at risk for depression, 12.5% for anxiety, and 8% for low self-esteem (Weber et al., 2023). Female athletes have higher risks of depression and anxiety compared to males. The use of alcohol is a risk factor for injuries in both soccer and basketball because it increases dehydration, slows reaction time, impedes muscle recovery, and reduces aerobic performance (Weaver et al., 2014). These findings underscore the importance of comprehensive injury prevention strategies, mental health screenings, and targeted interventions for college athletes across basketball and soccer.

Mechanisms of Injury

Basketball Knee and Ankle Injuries

The most common mechanism of knee injury in basketball is knee flexion in valgus with internal rotation (Hull et al., 2024). The knees are angled inwards placing stress on the medial side of the knee joint, causing injury to the medial collateral ligament (MCL), the ACL, and the medial meniscus. This often occurs when doing squats or walking. The main causes of basketball injuries are landing on someone's foot, landing awkwardly, changing directions, and collisions with other players or objects. Numerous factors contribute to injuries, including the biomechanics of jumping, landing, sudden changes in direction, and the physical demands placed on the body during the game. The most frequent injuries occur during a game while running and after contact with the ball (Aksovic, 2024).

Ankle injuries in basketball have two distinct mechanisms: sudden inversion with internal rotation and low plantar flexion, and inversion without internal rotation (Panagiotakis et al., 2017). Risk factors include a previous ankle injury and not stretching properly before a game (McKay, 2001).

Soccer Knee and Ankle Injuries

In soccer, the main mechanisms for knee injuries are direct contact by a blow to the knee, leg, or foot and non-contact such as twisting or turning improperly, or rapid deceleration. ACL injuries are often due to small knee flexion angles, high posterior ground reaction forces, and large quadriceps muscle forces (Yu & Garrett, 2007). The three major mechanisms for ACL injuries are small knee flexion angles, high posterior ground reaction forces, and large quadriceps muscle forces (Yu & Garrett, 2007). Ankle injuries in soccer frequently occur during tackles involving lateral or medial forces, causing eversion or inversion of the foot (Giza et al., 2003).

Injury risk factors include instability, inadequate equipment, and poor rehabilitation (Ekstrand & Gillquist, 1983).

Injury Rates and Prevalence

Basketball Knee and Ankle Injuries

Basketball injury rates are 22.8% for the knee and 20.4% for the ankle/foot (Borkar, 2021). Injury prevalence is 77% during training compared to 23% during gameplay (Hakizimana, 2005). Landing badly, running, and ball contact are common injury mechanisms (Aksović et al., 2024). The highest injury rates are among shooting guards followed by centers and point guards (Aksović et al., 2024). Male college basketball players have a higher incidence of ACL injuries overall than soccer players (Medhi, 2014).

Soccer Knee and Ankle Injuries

A 2024 study of male professional soccer players found that the highest incidence of injuries in professional soccer players was in the knee (48.21%) and ankle (30.36%), with strikers experiencing more knee injuries than other positions ((Tohid et al., 2024).

Ankle injuries, especially sprains, account for about half of soccer injuries (Nery, et al., 2016). The median ankle injury rate in youth soccer is 18% for boys and 30% for girls (Wik, 2022). The injury rate is greatest during soccer matches and increases with age (Mandarino et al., 2022).

Gender Differences in Injury Risk

Basketball Knee and Ankle Injuries

Female athletes in both sports have consistently demonstrated higher ACL injury rates than males ([Agel et al., 2005](#)). Recent studies have examined the differences in basketball injuries between male and female athletes. Female basketball players have a higher risk of ACL tears, due to differences in anatomy, muscle strength, and proprioceptive patterns ([Chernoff et al., 2023](#)). Female players also show greater knee valgus excursion and wobbling during single-leg squats contributing to increased ACL injury risk ([Aoki et al., 2023](#)). In male professional basketball players, ACL injuries often occur due to indirect contact during offensive cuts and landings. Guards are more susceptible to injuries with most happening in the scoring zone ([Tosarelli et al., 2024](#)). The incidence rate of ankle sprain injury is greater in male basketball players than in females ([Stojanovic, et al., 2023](#)).

Soccer Knee and Ankle Injuries

Recent studies have focused on gender differences in soccer injuries. Whereas male players experience more injuries overall, female players tend to suffer more severe injuries ([Mufty et al., 2015](#)). Female players sustain more indirect contact injuries than males ([Francesco Della Villa et al., 2024](#)). In non-contact ACL injuries, females are more likely to injure their supporting leg, while males tend to injure their kicking leg ([Brophy et al., 2010](#)). Due to their greater internal hip rotation and side-to-side hip abductor strength disparity, females have a higher risk of ACL injuries than males. Although males demonstrate greater strength, both genders exhibit limited hip rotation and poor abdominal core control ([Brophy et al., 2009](#)).

Recovery and Treatment

Basketball Knee and Ankle Injuries

Preventing knee and ankle injuries in basketball includes strength training, pre-conditioning exercises, and technical optimization. Rehabilitation begins with protection of function and progresses to customized retraining ([Wang, 2024](#)). A comprehensive physical and medical rehabilitation program for basketball players has shown better outcomes in ankle joint motion and functional exercise scores than traditional methods ([Li, 2024](#)). Proper rehabilitation and gradual return to sports are crucial for elite athletes recovering from acute ankle sprains ([Theodorakys et al., 2023](#)). Additionally, centrifugal training, using the force of inertia to create resistance, can improve joint mobility and reduce pain in injured athletes ([He, 2023](#)). Treatment approaches range from non-invasive methods to surgical interventions, including tendon repair, meniscus repair, knee or ankle ligament reconstruction, and fracture fixation. underlining the importance of proper diagnosis and tailored rehabilitation.

Soccer Knee and Ankle Injuries

A combination therapy approach to knee injury in soccer includes ACL reconstruction, microfracture cartilage repair, and hyaluronic acid scaffold treatment and has shown promising results. Patients typically return to pre-injury levels within 4.5 months ([Kacprzak & Rosińska, 2023](#)). For athletes injured for prolonged periods, a warm-up routine has the greatest impact on recovery time. Fewer participants with this regimen required surgical intervention ([Patel, et al., 2023](#)). The primary treatment for ankle injuries in soccer is the RICE protocol: Rest, Ice, Compression, and Elevation followed by gentle range of motion exercises. Once the initial swelling from the injury is reduced, progressive strengthening exercises, and an ankle brace or taping may be used for additional support. The surgical interventions in soccer are the same as those described in the basketball section.

Role of Cell-Based Therapies in Injury Recovery

Overview

Cell-based therapies, including stem-cell therapy and platelet-rich plasma (PRP), have emerged as ground-breaking treatments for athletes in high-impact sports like basketball and soccer. Soccer and basketball players frequently experience debilitating ligament tears, tendinitis, and muscle strains, which remove them from competition for prolonged periods. Cell-based therapies have emerged as promising options for enhancing tissue healing and reducing recovery times (Kolimi, et al., 2022).

Cell-based therapies use stem cells or growth factors to promote healing, regenerate damaged tissue, and restore function. Their goal is to accelerate recovery from injury, minimize the need for invasive surgery, and reduce the likelihood of long-term complications. Stem cell therapy and PRP injections are the two primary cell-based therapy approaches, and each offers different benefits. Professional leagues including the NBA and major soccer organizations have seen increased adoption of these treatments among their medical teams (van den Boom et al., 2020).

Stem Cell Therapy and PRP

Stem cell therapy involves harvesting undifferentiated cells from bone marrow or adipose tissue which can then differentiate into cartilage, muscle, or tendon cells. These cells can stimulate regeneration at the site of an injury by repairing damaged tissues (Abusalah, et al., 2024). Alternatively, PRP involves extracting and concentrating platelets from the patient's blood and injecting them into the injured area. The platelets then release growth factors that accelerate

tissue healing, promote new blood vessel formation, and decrease inflammation (Frey et al., 2024).

Stem cell therapy and PRP are distinct treatment methods but have similar benefits for injury recovery. Stem cells repair complex tissue damage by differentiating into the type of tissue needed, such as cartilage in the case of meniscus tears or tendon cells for ligament tears. Studies have shown promising results for stem cell therapy in treating conditions such as tendon injuries, cartilage defects, and osteoarthritis, common in soccer and basketball players. Stem cell therapy can significantly improve function and reduce pain in athletes with chronic tendon injuries. It is effective in Achilles tendinopathy, which is prevalent in soccer (Abusalah, et al., 2024).

PRP, although not as adaptable as stem cells, is also effective in treating a wide range of soft tissue injuries. For athletes involved in high-impact sports, such as basketball and soccer, PRP injections can accelerate the healing process by reducing inflammation and stimulating tissue regeneration. PRP injections significantly decrease pain and improve function in professional soccer players with patellar tendinopathy. In addition, PRP is less invasive than stem cell therapy and carries fewer risks. For these reasons, and because it offers a faster recovery time, it is a more appealing option for athletes (Frey et al., 2024).

Effectiveness in Pediatric and College-Aged Athletes

While most research on cell-based therapies has focused on professional athletes, there is growing interest in their effectiveness in pediatric and college-aged athletes. Young athletes in basketball and soccer have significant injury risk due to participation in high intensity play. The use of stem cell therapy in pediatric athletes is still relatively unexplored due to concerns about potential abnormal tissue development and growth plate disruption. However, in cases of severe injury that do not respond to traditional treatment methods, stem cell therapy may offer an

alternative to a more invasive procedure like surgery (Syed et al, 2024). In college-aged athletes, at the peak of their athletic careers, stem cell therapy and PRP have shown promise in accelerating recovery from injuries (Abusalah, et al., 2024) Cell-mediated therapies are especially effective in non-critical conditions like ligament sprains and muscle strains.

Conclusion

Knee and ankle injuries are prevalent in both soccer and basketball. The ankle is the most injured joint in both basketball and soccer players. ACL tears are the second most common injury in both sports. Gender differences also contribute to varying injury rates, particularly with female athletes being more susceptible to ACL injuries. Cell-based therapies, such as stem cell therapy and PRP, offer promising alternatives to traditional rehabilitation methods. These therapies help athletes return to active sports participation more quickly by decreasing inflammation and promoting tissue regeneration. Whereas research on their use in pediatric athletes is in its infancy, cell-based therapies show significant potential in college-aged athletes. These treatments improve recovery times and reduce long-term injury risks. As cell-based therapies evolve, they could become essential in managing sports injuries by providing faster and more effective recovery options for athletes of all ages in high-impact sports like soccer and basketball.

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