WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

ANKLE SPRAINS AND REHABILITATION STRATEGIES AMONG BASKETBALL PLAYERS: AN ANALYTICAL REVIEW

Dr. A. Abdul Halik, **Dr. P. Vignesh, ***G. Pushpa

*Director of Physical Education, Dr. Mahalingam college of engineering and Technology, Pollachi
**Director of Physical Education, Sri Eshwar College of Engineering, Coimbatore.
***Ph. D Research Scholar, Department of Physical Education, Bharathiar University.

ABSTRACT :

Ankle sprains represent one of the most common and debilitating injuries among basketball players, largely due to the intense physical demands of the sport, which include frequent jumping, rapid changes in direction, and high impact landings. This paper provides an analytical review of ankle sprains in basketball, exploring the mechanisms of injury, the prevalence of such injuries, and the risk factors that influence athletes to ankle sprains. A significant portion of the review is dedicated to examining the rehabilitation strategies that have been shown to facilitate effective recovery and prevent recurrent injury. It emphasizes the importance of a multifaceted approach, combining proprioception training, strengthening exercises, and neuromuscular control to optimize functional recovery. The paper also discusses the role of sport specific drills in the rehabilitation process and highlights the significance of a structured return-to-play protocol, including functional testing such as single leg hop tests and agility drills, to assess readiness for competition. Additionally, the review includes preventive strategies such as the use of ankle braces or taping and the importance of addressing biomechanical deficits. By synthesizing evidence from recent sports medicine literature, this paper aims to offer valuable insights for clinicians, coaches, and players, focusing on how structured rehabilitation programs can improve both recovery times and performance outcomes.

Keywords: Ankle sprain, basketball, rehabilitation, proprioception, injury prevention, return to play.

INTRODUCTION

Basketball is a fast paced, high intensity sport characterized by frequent jumping, pivoting, rapid changes in direction, and unpredictable landings, all of which place significant strain on the lower limbs, particularly the ankles. Among these injuries, lateral ankle sprains, which often involve damage to the anterior talofibular ligament (ATFL), are the most common and prevalent injuries in both amateur and professional basketball settings **(Fong et al., 2007).** These sprains typically occur when an athlete lands on an uneven surface, such as another player's foot, causing the ankle to twist beyond its normal range of motion, leading to overstretching or tearing of the ligaments.

Ankle sprains in basketball are not only a major concern due to their frequency but also because they contribute to extended recovery times and a high risk of recurrence if not properly rehabilitated. The biomechanics of these injuries, including the role of foot placement, body alignment, and ankle instability, make understanding their underlying causes crucial for developing effective prevention and rehabilitation strategies. Recent advancements in sports medicine have emphasized a multidimensional rehabilitation approach, focusing on proprioception, neuromuscular control, and strengthening exercises to improve recovery outcomes and reduce future injury risks. Additionally, a structured return to play protocol, guided by functional testing and sport-specific drills, ensures that athletes regain optimal ankle stability and function before resuming competition. This paper aims to explore the biomechanics of ankle sprains in basketball, examine the current rehabilitation practices, and provide recommendations for effective injury prevention and recovery strategies.

ANKLE SPRAIN

An ankle sprain is a common musculoskeletal injury that occurs when the ligaments surrounding the ankle joint are stretched beyond their normal limits or torn due to a sudden twisting or rolling motion. This type of injury typically affects the soft tissues on the outer (lateral) side of the ankle. The ankle is structurally designed to allow a range of motion in specific directions, but when that movement is excessive often during sports activities involving jumping, running, or rapid directional changes the ligaments may become damaged. The most frequent type is an inversion sprain, where the sole of the foot turns inward, placing excessive strain on the lateral ligaments, especially the anterior talofibular ligament (ATFL). In more severe cases, the calcaneofibular (CFL) and posterior talofibular (PTFL) ligaments may also be affected. Eversion sprains, which involve the foot turning outward and affecting the medial (deltoid) ligament, are less common due to the increased strength and support on the medial side of the ankle.

Lateral ankle sprains account for approximately 85% of all ankle injuries and are particularly prevalent in sports such as basketball, football, and volleyball. Symptoms usually include sharp pain, swelling, bruising, tenderness to touch, and difficulty bearing weight on the affected limb. Inadequate

rehabilitation can result in chronic ankle instability, reduced athletic performance, and a higher likelihood of recurrence. Therefore, early diagnosis, appropriate rest, and a structured rehabilitation program involving strength, flexibility, and proprioception training are essential for full recovery. Preventative strategies such as ankle taping, bracing, balance training, and proper footwear can significantly reduce the risk of injury. Addressing ankle sprains properly is vital, not only to restore normal function but also to prevent long term joint complications and ensure athletes return to their sport safely and effectively.

ANKLE SPRAINS FREQUENTLY OCCUR IN BASKETBALL PLAYERS

Sprained ankles are extremely common among basketball players due to the fast paced, high-impact nature of the sport, which involves frequent jumping, landing, quick directional changes, and sudden stops. These intense movements often place excessive stress on the ankle joint, particularly its lateral side. The most commonly injured ligament in an ankle sprain is the anterior talofibular ligament (ATFL), which connects the fibula to the talus bone and plays a crucial role in stabilizing the ankle during movement. Because of its position and function, the ATFL is especially prone to injury during inversion, when the foot rolls inward a frequent occurrence on the court. When the trauma or force applied to the ankle is more significant, the calcaneofibular ligament (CFL) may also become damaged. This ligament links the fibula to the calcaneus (heel bone) and offers additional lateral support to the ankle joint. Involvement of the CFL typically indicates a moderate grade sprain, often accompanied by pronounced swelling, tenderness, and limited mobility. In cases of severe trauma, such as a high-impact fall or forced dislocation, the posterior talofibular ligament (PTFL) may also be affected. The PTFL, which attaches the fibula to the posterior aspect of the talus, is the strongest of the three lateral ligaments and is usually only injured in more complex or high grade sprains. Injury to this ligament often suggests a more serious condition that could require longer rehabilitation or even surgical management. Recognizing which ligaments are involved based on the severity of the sprain is essential for appropriate treatment and prevention of long-term complications. For basketball players, timely diagnosis, proper rehabilitation, and injury prevention strategies are vital not only for full recovery but also for maintaining peak athletic performance and reducing the risk of recurrence.

ANKLE SPRAINS ARE DIVIDED INTO MILD TO SEVERE TYPES BASED ON LIGAMENT INJURY

Ankle sprains are classified based on the severity and extent of the damage to the ligaments, ranging from mild to severe injuries:

First-degree ankle sprains are considered the least severe type of sprain. They involve minimal damage to the ligaments, typically stretching a few of the ligament fibers without causing a tear. In this case, the affected athlete may experience mild discomfort, especially when turning or pressing on the ankle. Swelling is usually slight, and while there is some pain, it does not significantly hinder the player's ability to walk or move. Recovery is generally quick, with rest and basic self-care measures such as applying ice and elevating the foot being sufficient to manage the injury.

Second-degree ankle sprains are more serious, involving partial tears to the ligament. This type of injury is characterized by moderate pain, significant swelling, and bruising around the ankle. It can make walking difficult, as weight-bearing activities tend to worsen the discomfort. There may also be some instability in the joint. Treatment typically includes rest, physical therapy, and possibly the use of a brace or crutches to support the ankle during the healing process. While recovery is slower than for a first-degree sprain, most athletes can return to their activities once the pain subsides and mobility is restored.

Third-degree ankle sprains represent the most severe form of sprain, where the ligament is completely torn or ruptured. This results in intense pain, pronounced swelling, and often the dislocation of the ankle joint. The individual may be unable to move the ankle or bear weight on it, and the injury typically leads to significant instability. In some cases, surgical intervention may be necessary to repair the ligament and restore joint function. The recovery time for a third degree sprain is much longer, requiring a period of immobilization followed by physical rehabilitation to regain full range of motion and strength. Without proper treatment, athletes are at risk for long term instability and repeated sprains.

TREATMENT OF ANKLE SPRAIN

The treatment of an ankle sprain typically begins with conservative measures aimed at reducing pain and swelling. In the initial stages, applying ice packs to the affected area for about 20 minutes every two hours is essential in managing inflammation. Ice helps constrict the blood vessels, which reduces swelling and provides pain relief. Along with ice therapy, elevating the ankle above heart level and applying compression with an elastic bandage can further control swelling and support the injured area.

As the initial pain subsides, the focus shifts toward restoring mobility and strength to the ankle. This process often begins with gentle, controlled movement exercises, such as practicing walking or slowly bearing weight on the affected leg. These activities are crucial for preventing stiffness and ensuring that the ligaments regain their normal range of motion. Once the pain is significantly reduced, rehabilitation exercises that include stretching, strengthening, and proprioception exercises are introduced to help rebuild the strength and stability of the ankle. These exercises help the ligaments heal properly and reduce the likelihood of future injuries. some individuals experience recurrent sprained ankles, which may indicate chronic instability or weakness in the ligaments. If an ankle continues to sprain or if the ligaments fail to regain proper strength, surgical intervention may become necessary.

In cases of severe or repeated injuries, surgery is considered to repair damaged ligaments and stabilize the joint. Before surgery, diagnostic procedures such as ultrasound imaging are often used to assess the extent of the damage, as it helps doctors identify issues like scar tissue, bone fragments, or ligament tears. In some cases, a minimally invasive procedure using arthroscopy where a small camera is inserted into the joint can be performed. This allows surgeons to remove damaged tissue, such as bone flakes or scar tissue, and help stabilize the joint to alleviate chronic pain and prevent further damage. By addressing the root causes of instability, surgery can significantly improve long-term outcomes for athletes or individuals suffering from recurrent sprained ankles.

ANKLE STRENGTHENING EXERCISE

Ankle strengthening is a crucial component in both the rehabilitation and prevention of ankle sprains, especially for athletes like basketball players who place significant strain on their ankles through jumping, pivoting, and rapid directional changes. These exercises help restore muscle control, stability, and mobility in the ankle joint, reducing the risk of reinjury and improving overall performance.

To begin, the following resistance band exercises can be performed three times daily, with around 10 repetitions each. As the ankle becomes stronger and more stable, you can gradually increase the number of repetitions, sets, or the strength of the resistance band. However, it is important that these exercises do not cause sharp pain or increase swelling. Mild muscle fatigue is normal, but exercises should always remain within a comfortable range.

1.Ankle Dorsiflexion Against Resistance

This exercise targets the muscles at the front of the lower leg, responsible for lifting the foot. Sit with your leg straight and loop a resistance band around the front of your foot. Anchor the other end to a sturdy object in front of you. Begin with your foot pointed away from you, then slowly pull your foot back toward you, flexing at the ankle. Hold for a second, then return to the starting position. This movement strengthens the tibialis anterior muscle, which plays a vital role in ankle control during walking and running.

2. Ankle Plantar Flexion Against Resistance

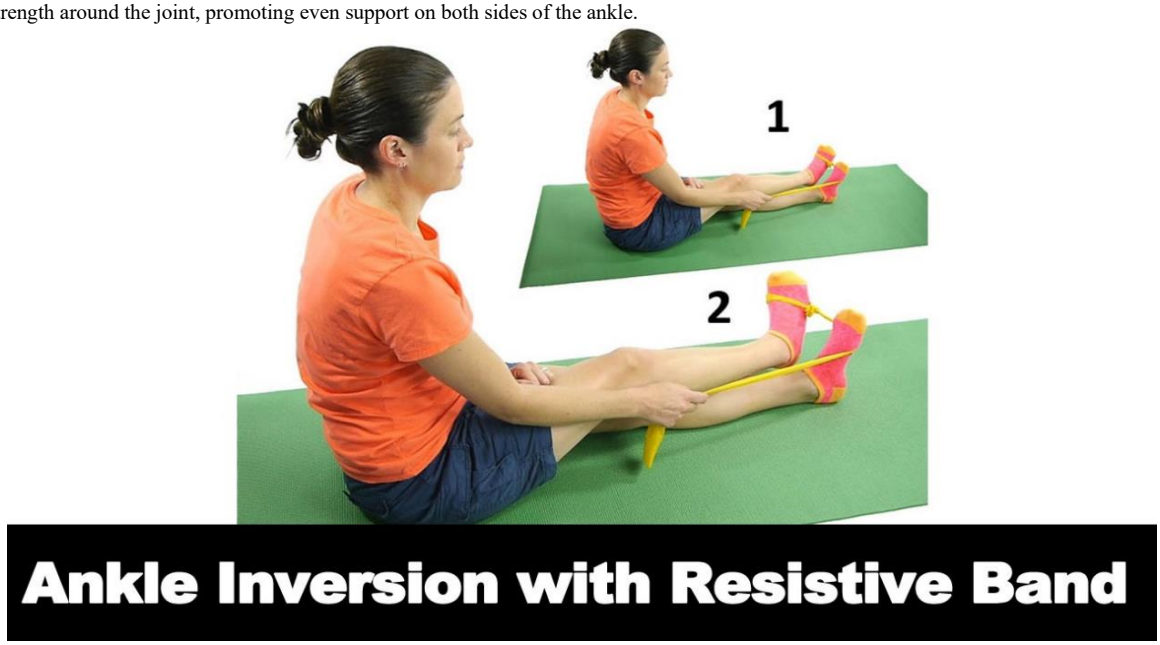
To strengthen the calf muscles and improve power during push-off movements like jumping, loop the band around the ball of your foot and hold the ends in your hands. Start with your foot flexed upward, then press it down slowly against the resistance, as if pressing a pedal. Hold briefly at the bottom before returning to the starting point. This helps improve the strength and coordination of the gastrocnemius and soleus muscles.

3. Ankle Eversion Against Resistance

Eversion exercises are important for strengthening the muscles on the outer side of the ankle, which are often overstretched during inversion sprains. Anchor the resistance band to the opposite side of your body and wrap it around the outside of your foot. Begin with your foot turned slightly inward, then push it outward against the band's resistance. Move in a slow and controlled manner, keeping the motion smooth. Strengthening the peroneal muscles through eversion can improve lateral stability.

4. Ankle Inversion Against Resistance

This exercise works the muscles on the inside of the ankle, especially the tibialis posterior. Anchor the band on the same side as the foot you're working on and loop it around the inside of your foot. Start with your foot turned slightly outward, then slowly pull it inward against the resistance. This helps balance the strength around the joint, promoting even support on both sides of the ankle.



RECOVERY MANAGEMENT

Immediate Management: The PR-I-C-E Protocol

When an ankle sprain occurs, timely and appropriate first aid can significantly influence the speed and quality of recovery. The PR-I-C-E method Protection, Rest, Ice, Compression, and Elevation is widely recommended by sports medicine professionals as an effective acute injury management strategy, especially within the first 24 to 72 hours. Each step of the protocol helps to reduce inflammation, limit tissue damage, and begin the healing process.

1.Protection

To prevent further injury to the already damaged ligaments, the ankle should be protected from weight-bearing and sudden movements. This can involve using splints, athletic tape, or an ankle brace. Protective support reduces the risk of aggravating the injury and gives the joint stability during early

recovery. According to the National Athletic Trainers' Association (NATA, 2013), early immobilization for severe sprains helps prevent chronic ankle instability.

2.Rest

Avoiding activities that place stress on the injured ankle is essential. Rest does not mean complete immobility but includes modifying activity levels to avoid pain or limping. Crutches may be used if walking is painful. Rest allows the body to begin the natural healing process without repeated trauma to the area. The American Academy of Orthopaedic Surgeons (AAOS, 2021) emphasizes that adequate rest in the early phase is crucial to avoid long-term complications.

3.Ice

Cold therapy is highly effective in managing swelling and pain. Apply a plastic bag of ice or a cold pack over the injured area for 15 to 20 minutes at a time, three to five times per day during the first 48–72 hours. Always place a thin towel between the ice and skin to prevent frostbite. Leave enough time at least 1.5 hours between sessions for the skin to return to normal temperature. A study by **Bleakley et al. (2004)** in supports intermittent icing over continuous cryotherapy for optimal results.

4.Compression

Wrapping the ankle with an elastic bandage (such as an ACE wrap) helps control swelling and provides mild support. Start wrapping from the toes and move upward toward the calf using even pressure. The wrap should be snug, not tight. Ensure circulation is not restricted if toes turn blue or feel cold, the wrap should be loosened immediately. Compression also helps limit joint movement in the early stages, which can protect healing tissues.

5.Elevation

Keeping the injured ankle elevated above the level of the heart helps fluids drain away from the injured site, reducing swelling. This is especially effective during the first few days post injury. Use pillows to prop the ankle up while lying down or sitting. Frequent elevation, especially during rest and sleep, can speed up the reduction of edema and pain.

PREVALENCE AND MECHANISM OF INJURY

Ankle injuries, particularly sprains, are among the most common injuries sustained by basketball players. Studies show that as many as 45% of all basketball-related injuries involve the ankle **(McKay et al., 2001).** This high prevalence highlights the importance of understanding the mechanisms behind these injuries to develop effective prevention and rehabilitation strategies.

Most ankle sprains in basketball occur during landing after a jump, especially when a player lands on an uneven surface or on another player's foot. This can cause the foot to twist or roll inward, a movement known as inversion. Inversion injuries are particularly hazardous because they apply force to the lateral ligaments of the ankle, primarily the **anterior talofibular ligament (ATFL)** and the **calcaneofibular ligament (CFL)**, which are essential for stabilizing the joint. The ATFL, being the most commonly injured ligament, is particularly vulnerable to damage due to its position and role in controlling ankle motion **(Yeung et al., 1994).**

In a study by **Hootman et al. (2007),** it was found that the rate of ankle sprains in basketball players is exacerbated by factors such as poor footwear, inadequate warm-up routines, and prior ankle injuries. Furthermore, the rapid direction changes and high-impact landing forces in basketball further increase the risk of sprains. Another key factor identified by **Bahr et al. (2005)** is the player's posture during take off and landing, which can predispose athletes to these injuries if not properly aligned.

Research has also highlighted that these injuries not only affect the player's performance but can lead to long term complications such as chronic ankle instability, which increases the risk of re-injury **(Hertel, 2008).** Consequently, athletes who have previously sprained their ankles are at a significantly higher risk of future sprains. This highlights the importance of early intervention and rehabilitation to prevent recurring injuries.

ANKLE SPRAIN PREVENTATION

Ankle Sprain Prevention-The Role of Ankle Support

Preventing ankle sprains, especially among athletes like basketball players, requires proactive measures, with ankle support playing a key role. One of the most common methods used in both practice and competition is ankle strapping or bracing. These techniques aim to enhance the stability of the ankle joint by reinforcing the ligaments both medial and lateral that help maintain joint integrity. The ankle joint, or tibiofibular mortise, is particularly exposed during activities involving jumping, cutting, and sudden directional changes. Strapping provides external support, helping to limit excessive movement and reduce the risk of ligament overstretching.

Ankle taping involves using adhesive or elastic sports tape applied in specific patterns around the ankle. These patterns are designed to mimic the natural lines of ligament tension, starting beneath the heel and progressing upward to "lock" the joint in a neutral position. This not only provides mechanical support but also offers proprioceptive feedback, increasing the athlete's awareness of ankle position during movement. Similarly, semi rigid or soft ankle braces are often used in place of or alongside tape. Studies such as those by ***Pederson et al. (1997)*** suggest that both taping and bracing significantly reduce the risk of ankle injuries in high-risk sports. Consistent use of ankle support, especially during training and games, can be an effective strategy for both injury prevention and long-term joint health.

ANKLE TESTS FOR BASKETBALL PLAYERS

Basketball players are especially prone to ankle injuries due to the sport's physical demands. To evaluate ankle health and readiness for return to play, several clinical and functional tests are commonly used by sports medicine professionals

1. Anterior Drawer Test

This test evaluates the integrity of the anterior talofibular ligament (ATFL), the most commonly injured ligament in lateral ankle sprains. The athlete sits or lies with the foot relaxed. The examiner stabilizes the tibia and pulls the heel forward. Excessive forward movement or a soft end feel indicates ligament laxity or a tear.

2. Talar Tilt Test

This assesses the calcaneofibular ligament (CFL). The test involves tilting the heel inward (inversion) while stabilizing the lower leg. A comparison to the uninjured ankle can help detect any looseness or instability, suggesting ligament damage.

3. Thompson Test

Although more common for Achilles tendon injuries, this test is sometimes used to rule out severe posterior ankle injuries. The athlete lies prone with feet hanging off the table. The calf is squeezed if the foot doesn't move, it indicates a possible tendon rupture.

4. Single-Leg Balance Test

This is a functional test that evaluates proprioception and neuromuscular control. The player stands on one foot with eyes closed or on an unstable surface. Difficulty maintaining balance indicates poor ankle stability, increasing injury risk.

5. Star Excursion Balance Test (SEBT)

This advanced dynamic balance test challenges the ankle's ability to stabilize during movement. The player reaches one leg in multiple directions while balancing on the other. It helps identify asymmetries, ankle instability, and functional weaknesses.

6. Range of Motion (ROM) Test

Using a goniometer, clinicians assess dorsiflexion, plantarflexion, inversion, and eversion. Limited mobility in any direction may point to stiffness or joint restriction post injury.

REHABILITATION STRATEGIES

Effective rehabilitation aims to restore joint stability, strength, and neuromuscular control. The process typically unfolds in the following phases

1. Acute Phase (0–72 Hours)

The acute phase begins immediately after the injury and focuses on reducing pain, swelling, and preventing further damage. The RICE protocol Rest, Ice, Compression, and Elevation forms the foundation of care during this stage. Applying ice packs for 15–20 minutes every few hours, elevating the ankle above heart level, and using compression bandages help manage inflammation. Protection of the joint through bracing or ankle taping is also recommended to limit movement and support the injured ligaments. Pain control is important, and nonsteroidal anti-inflammatory drugs (NSAIDs) may be used if necessary. Activities that put stress on the ankle should be avoided to allow the healing process to begin.

2. Subacute Phase (3–14 Days)

Once initial pain and swelling begin to subside, the focus shifts to gently restoring movement and preventing joint stiffness. During this subacute phase, patients are encouraged to perform pain-free range of motion (ROM) exercises, such as ankle circles and pointing the toes. Isometric strengthening exercises can also be introduced to maintain muscle tone without straining the healing ligaments. Proprioceptive training, using tools like wobble boards or balance pads, helps retrain the ankle's sense of position and movement, which is crucial for preventing future injuries.

3. Functional Phase (2–6 Weeks)

In the functional rehabilitation phase, exercises become more dynamic and targeted. Strengthening the peroneal muscles, which play a critical role in ankle stability, is a priority. This includes resistance band exercises for eversion and dorsiflexion. Balance training and neuromuscular drills, such as single-leg stance and controlled hopping, are integrated to improve coordination and joint control. Sport specific activities like cutting, pivoting, jumping, and lateral movements are gradually introduced to mimic real game situations and prepare the athlete for return to play.

4. Return to Play Phase (6+ Weeks)

By this stage, the athlete should be pain-free during full weight-bearing and show no signs of instability or discomfort during sport specific movements. Return to play is only considered once the player successfully completes functional performance tests such as the single-leg hop test, agility runs, and change of direction drills. These tests help confirm the athlete's readiness and reduce the risk of reinjury. Continued use of ankle supports or taping may be advised during games or high-intensity practice as a preventive measure. *Evidence supports neuromuscular training as critical in reducing reinjury rates* **(Hupperets et al., 2009).**

PREVENTION

Preventing ankle sprains in basketball players requires a combination of proactive strategies aimed at improving stability, correcting underlying weaknesses, and protecting the joint during high risk activities. One of the most effective methods is the incorporation of proprioceptive training programs, which help athletes develop better balance, coordination, and joint awareness, thereby reducing the likelihood of awkward landings or missteps. Exercises such as single-leg stands on unstable surfaces, agility ladder drills, and dynamic balance routines can significantly enhance neuromuscular control. Additionally, the use of ankle braces or taping during practices and games is highly recommended, particularly for athletes who have a history of previous sprains. These external supports provide mechanical stability and serve as a reminder to avoid high-risk movements. Another crucial aspect of prevention involves regular screening for biomechanical deficits, such as muscle imbalances, poor alignment, or limited range of motion. Identifying and addressing these issues through targeted strength and mobility training can help reduce stress on the ankle joint and minimize the risk of reinjury. Together, these measures form a comprehensive approach to maintaining ankle health and ensuring long term athletic performance.

CONCLUSION

Ankle sprains are among the most common and debilitating injuries in basketball, often resulting in significant downtime and, if not properly rehabilitated, high recurrence rates. This makes timely and structured rehabilitation crucial to ensure a full recovery and to reduce the likelihood of long term issues such as chronic instability or repetitive injury. A phase based rehabilitation approach, beginning with the acute management of pain and swelling, progressing through strengthening and proprioceptive training, and culminating in sport specific drills, is essential for restoring both mobility and strength to the ankle. Neuromuscular control exercises, in particular, play a pivotal role in retraining the body to prevent improper movements and minimize the risk of future sprains. Beyond rehabilitation, effective prevention is critical for maintaining ankle health over the long term. Incorporating proprioceptive exercises, utilizing ankle braces or taping, and addressing biomechanical deficits through regular screenings and corrective exercises are all key strategies in reducing the likelihood of injury recurrence. By prioritizing both rehabilitation and preventive measures, athletes can enhance their performance, avoid chronic ankle issues, and maintain optimal functional capacity. A comprehensive approach that combines rehabilitation and prevention is necessary to not only recover from an injury but also to safeguard long term athletic potential.

REFERENCES

1. Fong, D. T., Hong, Y., Chan, L. K., Yung, P. S., & Chan, K. M. (2007). A systematic review on ankle injury and ankle sprain in sports. *Sports Medicine*, 37(1), 73–94. https://doi.org/10.2165/00007256-200737010-00006
2. Hupperets, M. D. W., Verhagen, E. A. L. M., & van Mechelen, W. (2009). Effect of unsupervised home based proprioceptive training on recurrences of ankle sprain. *BMJ*, 339, b2684. https://doi.org/10.1136/bmj.b2684
3. McKay, G. D., Goldie, P. A., Payne, W. R., & Oakes, B. W. (2001). Ankle injuries in basketball: Injury rate and risk factors. *British Journal of Sports Medicine*, 35(2), 103–108. https://doi.org/10.1136/bjsm.35.2.103
4. Wright, I. C., Neptune, R. R., van den Bogert, A. J., & Nigg, B. M. (2000). The influence of foot positioning on ankle sprains. *Clinical Biomechanics*, 15(6), 443–448. https://doi.org/10.1016/S0268-0033(00)00004-0
5. Yeung, M. S., Chan, K. M., So, C. H., & Yuan, W. Y. (1994). An epidemiological survey on ankle sprain. *British Journal of Sports Medicine*, 28(2), 112–116. https://doi.org/10.1136/bjsm.28.2.112
6. Hootman, J. M., Dick, R., & Agel, J. (2007). Epidemiology of collegiate injuries for 15 sports: Summary and recommendations for injury prevention initiatives. *Journal of Athletic Training*, 42(2), 313-323.
7. Bahr, R., & Holme, I. (2005). Risk factors for sports injuries: A methodological approach. *British Journal of Sports Medicine*, 39(4), 105-107.
8. Hertel, J. (2008). Functional instability following lateral ankle sprain. *Sports Medicine*, 38(6), 409-421.