

# The Influence of the Evolution of Technical and Tactical Load in the NBA Small Ball Era on the Occurrence of Achilles Tendon Ruptures

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**Abstract.** Over the past decade, the NBA's Small Ball Era, defined by increased game tempo, a high volume of three-point shooting, and rapid offensive-defensive transitions, has fundamentally reshaped competitive basketball. Alongside these tactical changes, the incidence of Achilles tendon injuries has shown a marked rise. Small ball strategies demand repeated sequences of lateral movement, abrupt deceleration, and immediate vertical jumping within a single possession, generating eccentric loads on the Achilles tendon that can reach 9.8–11.7 times body weight during single-leg stop-jump actions. When combined with compressed schedules and inadequate recovery windows, these mechanical stresses accelerate the accumulation of micro-damage. Biomechanical evidence indicates that the mid-portion of the tendon, with its relatively poor vascularity and reduced collagen cross-link density, is particularly susceptible to rupture under such conditions. Recent clinical studies demonstrate that high-load eccentric training and blood flow restriction training can enhance tendon stiffness and collagen integrity, providing viable strategies for injury prevention. Future tactical evolution toward a taller and faster style of play will require targeted scientific interventions to balance peak performance demands with long-term musculoskeletal health.

**Keywords:** Small Ball Era, achilles tendon rupture, injury prevention, basketball tactics.

## 1. Introduction

Over the past decade, the landscape of technical and tactical play in the NBA has been completely reshaped by the "Small Ball" philosophy: spacing, speed, mismatches, and three-pointers have become the universal language of the league, while traditional low-post setups and physical battles involving centers have nearly vanished. During the 2023-24 season, the league's average number of possessions per game exceeded 100 for the first time in history, as teams sought more scoring opportunities through a higher volume of possessions. Additionally, the proportion of three-point attempts reached 39.2%, both of which stand as all-time highs [1]. These tactical innovations have significantly boosted offensive efficiency. At the same time, they have led to a sharp increase in players' physical workload and injury risk, with Achilles tendon rupture being a particularly prominent concern. The Achilles tendon is the thickest and strongest tendon in the human body, connecting the gastrocnemius-soleus complex of the lower leg to the calcaneus (heel bone). It serves as a critical structure for executing movements such as running, jumping, and sudden stops. An Achilles tendon rupture is a common yet severe lower limb sports injury, characterized by intense pain at the back of the lower leg, a break in the continuity of the Achilles tendon, and loss of plantar flexion function of the ankle. Epidemiological data indicates that Achilles tendon ruptures are more prevalent among individuals engaged in high-intensity sports, with professional basketball players being especially susceptible. During the 2024-25 NBA season, 7 players have already suffered complete Achilles tendon ruptures. Tactical demands have continuously driven up game tempo, running distance, and jumping frequency, while compressed schedules and commercial imperatives have further squeezed recovery windows. These factors have sparked widespread concern regarding the relationship between "Small Ball" tactics and injury risk.

From a biomechanical perspective, an Achilles tendon rupture is not a result of a single violent incident, but rather the cumulative outcome of long-term micro-damage under instantaneous overload [2]. Against the backdrop of the high-frequency offensive and defensive transitions that define the

Small Ball Era, players are required to contest shots beyond the three-point line and then recover to protect the rim, often executing centrifugal-to-centripetal transitions involving outward contests, abrupt stops, and subsequent jumps within a single possession. Kinematic analysis shows that guards and forwards cover a longer total distance, and their recorded maximum speed and peak acceleration are higher than those of centers. Furthermore, there is no difference among players of different positions in terms of the frequency of high-intensity running, player load, and acceleration/deceleration events. However, interior players with greater body weight may experience more significant centrifugal loads on their Achilles tendons [3]. These findings suggest that the typical movement patterns of the Small Ball Era are amplifying the potential risk of Achilles tendon injuries.

In addition to tactical evolution, the schedule and policy factors are further deteriorating the players' recovery environment. To enhance the entertainment value of the game, the Player Participation Policy (PPP) implemented since the 2023-24 season has set the threshold for star player awards at 65 games, significantly narrowing the space for player rotation. Official league statistics show that in the first season after the implementation of this policy, the total number of player absences reached 6,779 games, an increase of 14% compared to the previous year, with ankle-Achilles injuries accounting for 13.2% [1]. Championship-level teams often rely more on the performance of their core lineups, and key positioning battles often compress the rotation to 8-9 players, significantly increasing the average running distance per game for players, making their bodies more prone to fatigue, and their Achilles tendon instantaneous peak values more likely to exceed the threshold.

The integration of training and competition is also exacerbating the accumulation of hidden fatigue. To meet the high-intensity demands of the latter part of the season, back-to-back schedules and cross-time zone travel restrict sleep and muscle glycogen restoration, driving the cumulative load of training and competition beyond the tendon's physiological threshold and resulting in chronic fatigue accumulation. Despite continuous progress in imaging diagnostics, regenerative medicine, and rehabilitation training, the incidence of Achilles tendon injuries continues to rise, underscoring that the primary challenge lies in the persistent imbalance between workload and recovery capacity. Currently, research on the evolution of basketball tactics and the risk of Achilles tendon rupture is still relatively lacking. Therefore, this study aims to integrate game data with relevant literature in order to provide evidence-based support for the formulation of scientific scheduling and training interventions by the league, teams, and players, and to explore pathways toward achieving a new balance between competitive limits and career longevity.

## **2. Concept and Evolution of the Small Ball Era**

The "Small Ball Era" refers to the contemporary competitive basketball tactical system characterized by low center of gravity, high speed, and large space. Its main manifestation is that teams abandon traditional post centers, emphasize spreading the five players on the perimeter, and complete offense and defense transitions at high speed [4]. The Golden State Warriors won four championships with their "small-ball lineup," establishing the "Warriors Dynasty" and dominating both the regular season and playoffs, thus leading the entire league towards small-ball tactics. The fundamental reason is that this system has upgraded speed, space, and multi-positional skills from tactical highlights to the foundation of the system, and has made up for the natural shortcomings of traditional small lineups, which were strong in offense but weak in defense and rebounding. In order to adapt to the trend, teams gradually chose to extend the offensive range of centers to the three-point line to seek more cut opportunities and perimeter shooting chances.

The evolution of small-ball tactics can be divided into three stages. In the early stage, the Phoenix Suns led by Steve Nash established the foundation with their seven-second fast-break offense. The Orlando Magic, with Dwight Howard as their interior core, created a "one-big-four-out" lineup. In 2016, the Golden State Warriors, with Stephen Curry at the core, developed the "Death Five" lineup, which brought the five-out positioning and off-ball movement to its peak. Subsequently, the Houston

Rockets, with James Harden's extreme individual scoring, initiated their offense, almost abandoning mid-range shooting, and completed their attacks through driving to the basket for fouls and creating scoring opportunities for teammates. Since then, the league has widely adopted lineups of "one-big-four-small" or even "five-small," pushing traditional forwards to the center position. The mobility of wing players has replaced the slow-footedness of traditional centers, maximizing space and normalizing mismatches. Therefore, the small-ball era is not only a tactical label but also represents a redefinition of the composite load of speed, strength, and endurance for athletes.

### 3. Structural and Tactical Basis of the Small Ball Shift

#### 3.1. Lineup Innovation and Functional Reconfiguration

Using the classic "Death Lineup" from the 2014–2015 and 2018–2019 seasons as a reference, notable transformations in lineup composition and functional roles can be identified, as shown in Table 1 and Table 2.

**Table 1.** Functional Roles in Traditional Basketball Positions

Position	Functional Role
PG	Core of Organization
SG	Shooting Deterrence
SF	Versatile Offense
PF	Help Defense / Screening
C	Low Post / Rim Protection Core

**Table 2.** Functional Role Distribution in the Golden State Warriors' Lineup

Player	Height	Role	Position
Stephen Curry	191 cm	Offensive Core	Point Guard
Klay Thompson	198 cm	Offensive Core / Perimeter Shooting Threat	Shooting Guard
Andre Iguodala	198 cm	Playmaking / Cutting / Defense	Small Forward
Kevin Durant	208 cm	Offensive Core	Power Forward
Harrison Barnes	203 cm	Perimeter Shooting Threat	Power Forward
Draymond Green	201 cm	Playmaking / Defensive Anchor	Center

The Warriors' five players on the court all have heights that are not inferior to their counterparts in the same positions, and each possesses perimeter shooting ability. In the early days, Curry and Thompson utilized their formidable shooting skills to quickly rebuild the team and win a championship. Later, with the addition of Durant, the lineup's size and one-on-one scoring ability were further enhanced. This also addressed the issue that Curry, as the core player, was limited by his natural talent and lacked the ability to force one-on-one scoring in critical moments. Compared to the traditional lineup where each position has a specific role, the Warriors used the center as the core for organizing and linking up the offense. This not only maximized the shooting threat posed by Curry and Thompson but also drew the opposing center out of the paint for defense, thereby clearing the interior defense and creating opportunities for the forward players to cut and exploit mismatches in one-on-one situations. This lineup composition achieved a significant expansion of offensive space and provided a model for the league's shift towards small-ball tactics.

#### 3.2. Defensive Adaptations through Mobility

The Warriors compensate for their height disadvantage through infinite switching on defense. After Green took on the role of the center, he could match up with traditional centers individually, relying on his 2.17-meter wingspan and 109-kilogram weight. Even when facing post-up plays, he is not easily overpowered. At the same time, Green's perimeter shooting ability and mobility force

traditional centers into unfavorable positions on both ends of the court. The other four players on the perimeter, with their quick footwork, give the lineup excellent switching elasticity. They turn pick-and-roll plays into non-mismatched one-on-one situations, reducing the need for secondary help defense. Playoff data from the 2016-2017 season shows that when the Warriors' small-ball lineup was on the court, opponents had a turnover rate of 18.4%, and the team allowed only 101.2 points per 100 possessions, the second-lowest in the league. Green, Iguodala, and Durant, the three forwards, combined for an average of 25.7 rebounds per game, effectively addressing the rebounding weakness of traditional small lineups [1]. This evidence indicates that small-ball lineups can offset their height deficiency on the defensive end through mobility and teamwork.

## **4. Mechanism of Achilles Tendon Rupture**

### **4.1. Chronic Fatigue and Progressive Overload**

Achilles tendon rupture typically does not result from a single violent event, but rather is a progressive process where micro-injuries accumulate, the matrix becomes imbalanced, and ultimately structural failure occurs under instantaneous overload [5]. In sports such as basketball that require repeated jumping and stop-and-go movements, the Achilles tendon must withstand tensile stresses up to 10-12 times body weight within 0.15 seconds. Since the 2-6 cm mid-portion of the Achilles tendon has relatively poor blood supply, the lowest oxygen saturation, and the lowest collagen cross-link density, it is the most susceptible area for micro-crack initiation [6]. During the NBA playoffs from 2024 to 2025, Tatum, Lillard, and Haliburton all suffered Achilles tendon ruptures due to playing while injured. A video analysis of 86 professional football players showed that when athletes experience more than 110 stop-and-go cycles or a sudden increase in training volume during the season, type I collagen is gradually replaced by type III collagen, tendon stiffness decreases, and rupture occurs during what appears to be a routine push-off motion. 83% of Achilles tendon ruptures occurred in non-contact scenarios, and 45% happened in the first 30 minutes of the game, suggesting that the imbalance between fatigue and recovery is a triggering factor [7]. In addition to mechanical overload, systemic factors can significantly lower the safety threshold of the Achilles tendon. A multicenter case-control study indicated that fluoroquinolone antibiotics, local injections of corticosteroids, obesity, and type II diabetes are all positively correlated with the risk of Achilles tendon rupture. These findings suggest that Achilles tendon injury is a progressive outcome of the combined effects of chronic overloading and systemic factors.

### **4.2. Acute Rupture and Biomechanical Failure**

The mechanism of acute Achilles tendon rupture can be integrated into two interacting pathways: biomechanical overload and microstructural degeneration. In the acute phase, the gastrocnemius - soleus complex can instantaneously generate tension up to 6 to 12 times body weight during intense eccentric contraction. When the load exceeds the Achilles tendon's ultimate strength (about 50–100 MPa), a grade III tear can occur. Such violent events are common in sports like basketball, badminton, and track and field that require sudden jumping, stopping, or pushing off, especially in individuals with inadequate warm - up and increased tendon viscosity [8]. Epidemiological studies show that men, people aged 30 to 50, the obese, and those with irregular exercise habits are high - risk groups. They all share characteristics of tendon homeostasis imbalance and coupling with acute load peaks. Clinically, patients often hear a "pop" at the moment of rupture, followed by weakness in heel - raising, a depression in the Achilles tendon, and a decrease in plantar flexion torque. MRI or ultrasound shows discontinuity of tendon fibers. Therefore, Achilles tendon rupture is the result of the combined effects of external high - energy loads and internal degenerative accumulation. Its prevention and treatment need to consider neural - muscular warm - up before exercise, gradual load progression, and systemic disease management [9].

### **4.3. Competitive Impact of Achilles Tendon Rupture**

Achilles tendon rupture has a devastating impact on the competitive performance of professional athletes and often leads to role reshaping. Shoot - dominant forwards can convert the loss of explosiveness into efficiency gains by increasing the arc of their jump shots and exploiting mismatches in post - up situations, thereby maintaining an All - Star - level output. Wilkins in the 1992 - 1993 season and Durant in the 2020 - 2021 season are examples of players who maintained high - scoring efficiency after rupture. In contrast, wings or big men who rely on explosiveness and agility often suffer irreversible losses in defense and explosiveness after such serious injuries. Kobe's average points per game dropped from 23.0 to 17.6 in the 2014 - 2015 season, with his shooting percentage falling to 37.3%; Cousins' low - post shooting percentage plummeted by 18 percentage points in the 2018 - 2019 season; and Klay Thompson, after returning in the 2022 - 2023 season, had a noticeable decrease in drives and stop - and - pop jump shots. These cases illustrate that Achilles tendon rupture often reduces an athlete's ability to convert eccentric to concentric contractions, slows down defensive lateral movement, and leads to a simultaneous decline in scoring efficiency and positional value. Ultimately, this forces players to reduce their playing time or transition to lower - usage roles.

## **5. Evolution of NBA Tactics in the Small Ball Era**

### **5.1. Phased Development of Small Ball Strategies**

During the embryonic stage (2004-2011), the 7-second offense initiated by the Phoenix Suns and the "one interior, four perimeter" system built by the Orlando Magic initially verified the feasibility of high-tempo offense and three-point tactics. In the formation stage (2012-2015), the Miami Heat's experiment of playing Chris Bosh at the 5 position and the Golden State Warriors' championship victory with their "Death Lineup" (a small-ball lineup) established a championship formula centered on small lineups and spaced-out floor. In the proliferation stage (2016-2019), the league's average number of possessions per game rose sharply, and fast pace became a universal strategic choice for most teams. Since 2020, the Small Ball Era has reached a consolidation phase, during which the five-out alignment has become a league-wide norm. In this setup, even the nominal center is expected to stretch his range to the perimeter, allowing four additional shooters to occupy the arc and fundamentally alter half-court spacing.

### **5.2. Quantitative Shifts in Tactical Indicators**

Over the past decade and more, the tactical style of the NBA has undergone constant innovation and transformation, which has influenced the spectatorship and competitiveness of games (see Table 3). From the 2013-2014 NBA season to the 2024-2025 season, the quantitative evolution of core tactical variables has revealed the development trajectory of modern basketball. One of the most notable changes is the acceleration of game tempo. The number of possessions per game has increased from 93.9 to 99.2, and behind this change is the rise of the transition offense priority strategy. Teams are paying more and more attention to launching offenses quickly after successful defense. This fast-paced style of play not only enhances the spectatorship of games but also improves game efficiency. The importance of three-pointers has increased significantly: the average number of three-point attempts per game has risen from 21.5 to 37.5, and the average number of three-pointers made per game has gone up from 7.8 to 14. The driving factors behind this change are the "Curry Effect" and the popularization of the small-lineup formula. The emergence of Stephen Curry has transformed the original tactical style of the NBA. His accurate three-point shooting and excellent shooting ability made teams realize the importance of three-pointers. The Golden State Warriors, with their small lineup, won three championships in four years and were officially recognized as a dynasty team, which further promoted the development of three-point shooting. Teams have increasingly used smaller players, emphasizing speed and flexibility, thereby increasing the number of three-point

attempts. However, this shift in tactical style has gradually marginalized the role of traditional low-post offense, with points scored in the paint dropping from 42.3 to 38.1. The accelerated game tempo means that the tactical setup and time consumption of low-post offense are no longer adapted to the needs of modern basketball, and teams rely more on fast breaks and perimeter shooting.

**Table 3.** Quantitative Shifts in Core Tactical Indicators across NBA Regular Seasons

Dimension	2013–14 Season	2024–25 Season	Change	Driving Factors
Number of possessions per game	93.9	99.2	+5.3 possessions	Emphasis on transition offense
Average three-point attempts per game	21.5	37.5	+16 attempts	Curry effect and spread-offense adoption
Average three-point makes per game	7.8	14.0	+6.2 made shots	Proliferation of small-lineup formula
Points in the paint (0–4 feet from basket)	42.3	38.1	–4.2 points	Faster pace marginalizing traditional low-post scoring

### 5.3. Transformation of Player Roles

In the evolution of NBA tactics, significant transformations have occurred in player roles and skills (see Table 4). Traditional low-post centers like Brook Lopez have shifted from interior one-on-one play to become stretch 5 with three-point shooting ability, creating space for offensive plays. Traditional forwards such as Draymond Green have transformed into versatile 4/5, equipped with the ability to execute short rolls and provide help defense, balancing both offensive and defensive responsibilities. Guards like Devin Booker have evolved into combo guards with forward-like capabilities; they not only orchestrate offenses but also excel at cutting and catch-and-shoot plays, adapting to the fast pace and flexible tactical demands of modern basketball. These transformations reflect players’ adaptability, driving the diversification of basketball tactics and the innovation of technical and tactical approaches. This has made games more exciting and efficient, further propelling the development of basketball as a sport.

**Table 4.** Transformation of Player Roles

Traditional Role	Role in the Small Ball Era	Key Skill Transition	Representative Player
Low-post Center	Stretch 5	Expanded range with reliable three-point shot	Brook Lopez
Traditional Forward	Versatile 4/5	Short-roll playmaking and enhanced help defense	Draymond Green
Point Guard	Combo Guard with forward traits	Integration of cutting and catch-and-shoot skills	Devin Booker

## 6. Mechanism of Injury Outbreak in the Small Ball Era

### 6.1. From High–Slow–Heavy to Small–Fast–Agile Tactical Models

From the 2013 - 2014 season to the 2024 - 2025 season, the league's average number of possessions per game increased from 93.9 to 99.2, and the average number of three - point attempts per game rose from 21.5 to 37.5, indicating a continuous acceleration of game pace. After the space was completely stretched out, points in the paint actually decreased by 4.2, with more of the scoring in the restricted area coming from cuts and mismatches instead of traditional low - post play. This means that each time a player attacks the basket, it is accompanied by higher instantaneous acceleration and greater eccentric load. The combination of increased running and jumping and a high number of possessions has also increased the risk of injury for players. Therefore, the high speed and high - frequency

confrontation under the small - ball model does not simply improve game efficiency. It also systematically amplifies the vulnerability of the lower - limb tendons.

## **6.2. Chronic Overload and Cumulative Tendon Stress**

Against the backdrop of the widespread adoption of small-ball tactics, professional players may accumulate more than one hundred high-intensity games per year, encompassing regular-season contests, playoffs, mid-season tournaments, and national team competitions, with recovery windows markedly compressed. Within this tactical system, all positions from one to five are required to repeatedly execute short sprints, abrupt stops, and rapid re-accelerations. The gastrocnemius–soleus complex must generate tensile forces of approximately 6–12 times body weight within 0.34 seconds, a level approaching or even exceeding the ultimate strength of the Achilles tendon (50–100 MPa) [10]. Positional mismatches, such as centers defending on the perimeter or guards contesting in the paint, subject the tendon to repetitive loading at abnormal joint angles, accelerating the accumulation of fatigue-induced micro-injuries. Since the collagen remodeling cycle of tendons typically requires 4–6 weeks, while congested schedules often mandate renewed high-intensity play within less than 7 days, the imbalance produces a cascade of micro-fissures, local inflammation, degenerative changes, and eventual macroscopic rupture [11]. When the rate of micro-injury accumulation persistently exceeds the tendon’s intrinsic repair capacity, irreversible structural degeneration occurs [12]. Thus, the seven Achilles tendon ruptures reported during the 2024–2025 NBA season should be regarded not as isolated accidents but as the predictable outcome of the systemic mismatch between tactical demands, competitive scheduling, and the physiological thresholds of athletes.

## **7. Prevention Strategies and Practical Paths for Achilles Tendon Rupture**

Achilles tendon rupture is rarely the result of a single violent event but rather a structural failure under acute overload following the gradual accumulation of chronic micro-injuries. Consequently, prevention strategies should shift focus from post-injury repair to proactive intervention, reducing risk through a multidimensional and systematic framework. Current evidence highlights three critical pathways: strengthening of tendon structure, optimization of neuromuscular control, and regulation of external load, all supported by precision management at the individual level. The mechanical strength of the tendon is a key determinant of its tolerance to explosive loading. Regular eccentric loading has been consistently validated as an effective intervention, significantly improving tendon tensile strength and reducing rupture incidence [13]. A randomized controlled trial of 46 subjects with Achilles tendinopathy demonstrated that a 12-week high-load eccentric calf protocol (Alfredson heel-drop), performed three times per week, increased tendon cross-sectional area by 7.77% ( $p < 0.01$ ) and Young’s modulus by 36.15% ( $p < 0.01$ ), outperforming low-load and passive treatments. These findings indicate that heavy, slow, repetitive eccentric loading systematically enhances tendon stiffness and integrity through type I collagen remodeling and matrix compaction [14]. In addition, blood flow restriction training (BFRT) has emerged as a promising method in tendon rehabilitation. Under low-load conditions, BFRT elicits localized metabolic stress that promotes collagen synthesis and angiogenic activity, making it a practical option for professional athletes whose training intensity is constrained during the competitive season [15].

Systematic regulation of external load is equally critical. Although the Player Participation Policy introduced in the 2024–2025 season was designed to increase player availability, epidemiological data demonstrate that an acute-to-chronic workload ratio (ACWR) above 1.5 substantially elevates the risk of lower-limb tendon injuries. At the team level, individualized load monitoring systems should therefore be implemented, incorporating GPS tracking, accelerometers, and ultrasonic elastography to quantify jump frequency, peak eccentric loads, and micro-damage signals. When combined with physiological markers such as sleep quality, heart rate variability, and glycogen recovery, these data can guide dynamic adjustments of training and competition intensity. High-risk screening and tiered interventions should also be institutionalized. Risk factors include age over 30,

BMI above 28, previous Achilles pathology, abnormal foot structure (e.g., flatfoot), and long-term use of fluoroquinolones or corticosteroid injections [13]. Accordingly, pre-season health records should incorporate tendon elastography and isokinetic strength testing to identify vulnerabilities and tailor interventions. Low-risk players may continue routine training, medium-risk individuals should increase eccentric loading frequency and adopt biomechanical insoles, while high-risk athletes require enforced rest, BFRT-assisted recovery, and restrictions on abrupt stop-and-go or high-frequency jumping drills. In summary, the prevention of Achilles tendon rupture requires an integrated approach combining structural reinforcement with systematic load management, reinforced by technological monitoring and regulatory frameworks. Future research should further assess the utility of AI-based multidimensional workload prediction models and serum collagen biomarkers such as PIIINP for risk stratification, ultimately enabling a scientific framework for managing training, competition, and recovery while balancing peak performance with career longevity.

## 8. Future Evolution of Basketball Tactics

The diminishing returns of the Warriors' small-ball lineup have underscored vulnerabilities in rebounding and long-term load management. In contrast, the "tall, fast, and accurate" model demonstrated on the FIBA stage has drawn increasing attention from NBA teams. Germany, the 2023 FIBA Basketball World Cup champion, achieved success with an average roster height of 203 cm, while Victor Wembanyama of France, standing at 224 cm yet possessing forward-like skills, has illustrated the feasibility of a "one-big-four-forward" configuration. This approach preserves height without sacrificing speed, sustains perimeter accuracy, and reintroduces low-post mismatches, while redistributing stop-and-go loading from guards to frontcourt players.

With the trial implementation of a new rule on verticality in help defense beginning in 2025, the NBA's tactical environment may undergo gradual adjustment over the next five years. Likely trends include a reduction in possessions and a lower reliance on three-point volume, in pursuit of greater balance between offensive and defensive efficiency. Persisting with extreme small-ball lineups to maximize pace, however, would continue to heighten the risk of injury due to cumulative load and inadequate recovery. Overall, the league's trajectory is more likely to shift toward a "taller and faster" model rather than sustained dependence on the extreme "small, quick, and agile" paradigm.

## 9. Conclusion

This study draws on publicly available NBA statistics and peer-reviewed clinical research to examine how tactical and technical changes during the Small Ball Era intersect with the rising incidence of Achilles tendon ruptures. Over the past decade, possessions and three-point attempts have increased markedly, concentrating eccentric stress from repeated stop-and-go movements within each game. The Player Participation Policy, combined with frequent cross-time zone travel, has elevated the acute-to-chronic workload ratio, accelerating the accumulation of tendon micro-injuries. At the same time, controlled trials have clarified the efficacy of specific preventive methods. For example, 12 weeks of high-load eccentric calf training significantly improved tendon stiffness and cross-sectional area, while blood flow restriction training showed benefits for athletes constrained by in-season workloads. Together, these findings outline practical avenues for lowering rupture risk. In addition, the technical trajectory represented by players such as Wembanyama signals a tactical shift from "extreme small" units to lineups emphasizing height, speed, and shooting accuracy, with Achilles tendon risk profiles likely shifting from backcourt players toward taller forwards and centers.

The present analysis is constrained by its reliance on aggregated data and secondary sources. Without longitudinal tracking of player-level workloads or tendon imaging, conclusions remain largely correlational. Interactions with other variables, including footwear design, court surface, and demographic factors, are insufficiently addressed, which limits the applicability of findings beyond

the NBA's particular competition structure. To refine causal understanding, multicenter cohorts across leagues such as the WNBA and EuroLeague, integrating tendon imaging and biomarkers of collagen turnover (e.g., PIIINP), should be combined with AI-based load modeling to identify thresholds for safe training and competition.

Rather than treating small-ball tactics as inherently damaging, this study emphasizes that injury risk arises when elevated workloads are not matched with adequate recovery, exposing the Achilles tendon's limited vascularity. Policy interventions could help restore balance. Lowering the PPP game threshold from 65 to 58, allowing exemptions for athletes with high tendon risk, and mandating the use of GPS and ultrasound monitoring would improve early detection of overload. Embedding eccentric training and BFRT within the collective bargaining agreement as standard practice could further enhance player resilience. Such structural changes would allow the league to sustain high-level competition while mitigating the long-term cost of tendon failure.

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