Catastrophic Achilles Tendon Rupture: Tyrese Haliburton in Game 7 of the NBA Championship Finals – Brad Stenger

Abstract

Catastrophic soft tissue injuries to athletes are not normally considered engineering system failures, but technologic improvements have increased the amount of information available about athletes' health and performance. At the same time elite athletes face unprecedented demands during their training and development in order to reach highest possible performance levels. The circumstance was on display in June, during the NBA Championship Finals between the Indiana Pacers and Oklahoma City Thunder, a winner-takes-all seven-game series. The best player for the Pacers, Tyrese Haliburton, ruptured his Achilles tendon during Game 7, after suffering a calf strain in Game 5. Injury analysts have developed strong anecdotal cases for specific biomechanical movements and for athletes' "overuse" playing a role in these type of injuries, but no causal links. Predictive models for injury rate and injury risk exist but have not yet developed to point where they can be applied for preventive purposes. Managing risk boils down to a play or do-not-play decision where play is often the only option given the high stakes of competition. The situation puts teams, athletes and fans in the difficult position, trying to navigate tradeoffs between near-term team opportunity, long-term athlete health and ongoing fan entertainment.

Introduction

The scoreboard clock for Game 7 of the NBA Finals between the Indiana Pacers and Oklahoma City Thunder had run down just seven minutes. The game, still getting started, was close, like the series had been between the two teams. Indiana needed a good game from their best player, Tyrese Haliburton, in order to win. Haliburton had suffered a calf injury in Game 5 and then played well in the team's Game 6 win in which the Pacers built a big early lead on their home court. But Indiana and Haliburton had to travel to the favored Thunder for the final game to decide the champion. Seven minutes into the game, Haliburton was probably soon to sub out. If there was a time to test what his injured leg was capable of, to see if he could take over a game for his team, this was the moment.

In 2019 the Golden State Warriors and that team's star Kevin Durant were in a similar situation. Kevin Durant was playing through a calf strain injury and in Game 5 of the NBA Championship series, he ruptured his Achilles tendon. He was dribbling the basketball, moving into a position to drive past his opponent. Durant moved his injured right leg behind his center of mass instinctively, setting it up to push off and explode him forward in the horizontal plane. Durant's calf-tendon unit was simultaneously stretched and subject to ground reaction force. Adam Petway, a researcher at Mississippi State University, calls this movement a "false step" and regular cause of Achilles tears in basketball players who also have a compromised calf muscle. The calf-tendon unit is subject to tremendous force and the stretched tendon cannot support the extranormal load, picking up slack for a weakened muscle. Durant and now Haliburton would both take a false step (now more often called a "negative step") and attempt to explode forward, only to rupture the Achilles tendon, and in a moment dramatically reduce his team's chances to win the game and the Championship.

A comparison between two superstar basketball players six years apart is not a prediction or a risk model for injury. Petway provides evidence that risk of Achilles rupture is elevated by calf strain. If the game was not for the championship the lower stakes would have given the team and the player an option to sit out the game and avoid further injury risk. Athletes and the sports stakeholders whose decisions affect athletes' health are prone to basis their cost-benefit risk analysis on conjecture, not

analysis, in large part because injury rate and prediction models are not precise, and without substantial improvement, may not even be useful.

Traditional sports injury epidemiology is based on counts. Call it a “frequentist model” where a number for injury occurrences divided by another number for injury exposures is the number for “injury rate.”

> The injury rate is often standardized per 1,000 or 10,000 AEs [5, 8, 9, 13, 14]. Using this framework, it is also common practice to examine how and whether the injury rate varies systematically across risk groups using standard methods such as injury rate ratios [9, 12]. Importantly, traditional approaches to calculating surveillance-based injury rates use a frequentist perspective, relying exclusively on an observed sample of data collected in a given context (such as competition setting), or sport to produce estimates.

The description of sports injury rate methodology comes from a recent paper by Avinash Chandran of Datalys Center for Sports Injury Research and Prevention, the organization that oversees athlete injury surveillance for the NCAA. In the paper, "Bayesian methods for estimating injury rates in sport injury epidemiology" Chandran writes, it is "possible to conceive of the injury rate as the outcome of a data generating process which can be modeled--the approach taken in Bayesian inference" and goes on to conceptualize a Bayesian model that formulates injury rate in a sports injury surveillance system.

Another paper by Paul Wu of Queensland Institute of Technology and Australian Institute of Sport combines survival models and a two-state Hidden Markov Model to model and predict "subsequent injury events" (that is, injuries that follow an initial injury). The situation mirrors the Haliburton case even though the study data comes from one season and one team in the Australian Football League, a game that is more like rugby than NBA basketball. The authors’ choice to model prior-subsequent injury is an insightful constraint on the injury prediction challenge, one that in the future should help to determine the risk of catastrophic Achilles tendon failure when the weakened condition of the calf-Achilles muscle-tendon unit can gauged accurately.

If the norm in elite competitive sports was to act with an abundance of caution, the Haliburton Achilles tear would have been avoided because he never would have seen the court given the known associated risk that a calf strain imposes on the Achilles tendon. The more interesting question is how much more work will it take for predictive sports injury models to gain currency among athlete health decision-makers. The work and the advances from the work are in a race against changes in the way games are played. Durant was 30 years old at the time of his catastrophic injury. Haliburton was just 23. Basketball experts cite in an increase in wear and tear on elite basketball players that is the result of more frenetic, wide-open playing styles geared toward three-point scoring which, for the most talented young players, is non-stop, four-season, singular pursuit starting years before an athlete reaches college-age.

Body

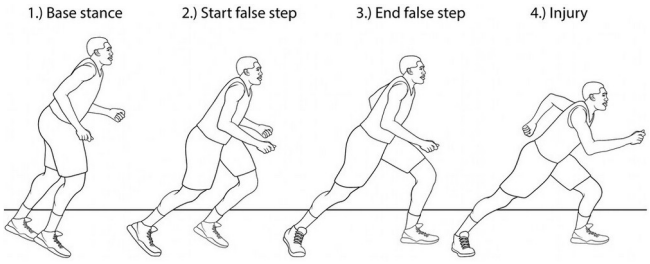
The Haliburton injury has an immediate cause, the "negative step," which it shares with other similar injuries to Kevin Durant and Jayson Tatum. But the cause is correctly described as an athletic posture that occurs frequently in every team sport, hundreds of times in a competitive match and thousands of times during an elite basketball player's career. The one negative step that results in catastrophic injury is indistinguisable from all of the many other negative steps that do not. So the immediate cause of the injury is not, in fact, the root cause of Haliburton's torn Achilles tendon. The root cause is almost certainly overuse, stemming from years of too much basketball going back to early teenage and then

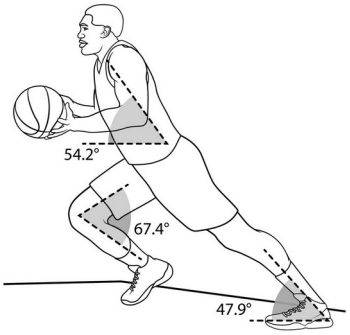
continuing to the Pacers' 22 playoff games in a two month span leading up to the team's and Haliburton's crowning achievement, Game 7 of the NBA Championship series.

The physical causes of the tendon rupture are anecdotal and lack the evidence to produce statistical rigor. Contemporary advances in data science are only now able to put forward more rigorous, and sensible, injury rate, risk and prediction models with a more solid reality-based analytical footing. Continued progress toward a statistical understanding of athletes' injuries should, in time, become the monitoring system for future elite athletes as they pursue their goals.

Petway et al. analyzed video of 13 torn Achilles cases of NBA athletes. 12 of the 13 injuries did not involve external contact and also showed the negative step movement pattern. "In all videos analyzed, the athlete took a backward step with the injured limb well outside of the base of support without any displacement of the body center of mass (BCM) (ie, posterior and outside of the BCM). This motion was followed by rapid ankle dorsiflexion of the injured limb and lowering of the trunk. The sequencing of these movements can be seen in Figure 3." (Below right.)

The negative step approximates the motion of a sprinter launching forward from a starting block. Force from the calf-Achilles unit pushes the ground, and ground reaction force (GRF) propels the body forward in the horizontal plane. At the same time the Achilles tendon stretches during dorsiflexion. Momentum increases as the body accelerates but the compromised calf muscle cannot keep up with the GRF, imposing a force requirement on the tendon that it was not equipped to handle. "The average dorsiflexion angle of the injured ankle was 47.9° (6.5°), the average trunk flexion angle relative to the hip axis was 54.2° (6.8°), and the average knee flexion angle of the lead leg (non-injured limb) was 67.4° (17.4°)." Petway also makes the point that the Achilles has likely been degraded as a result of cyclical loading (overuse) and age (average athlete age in the video analysis: 30 years old).





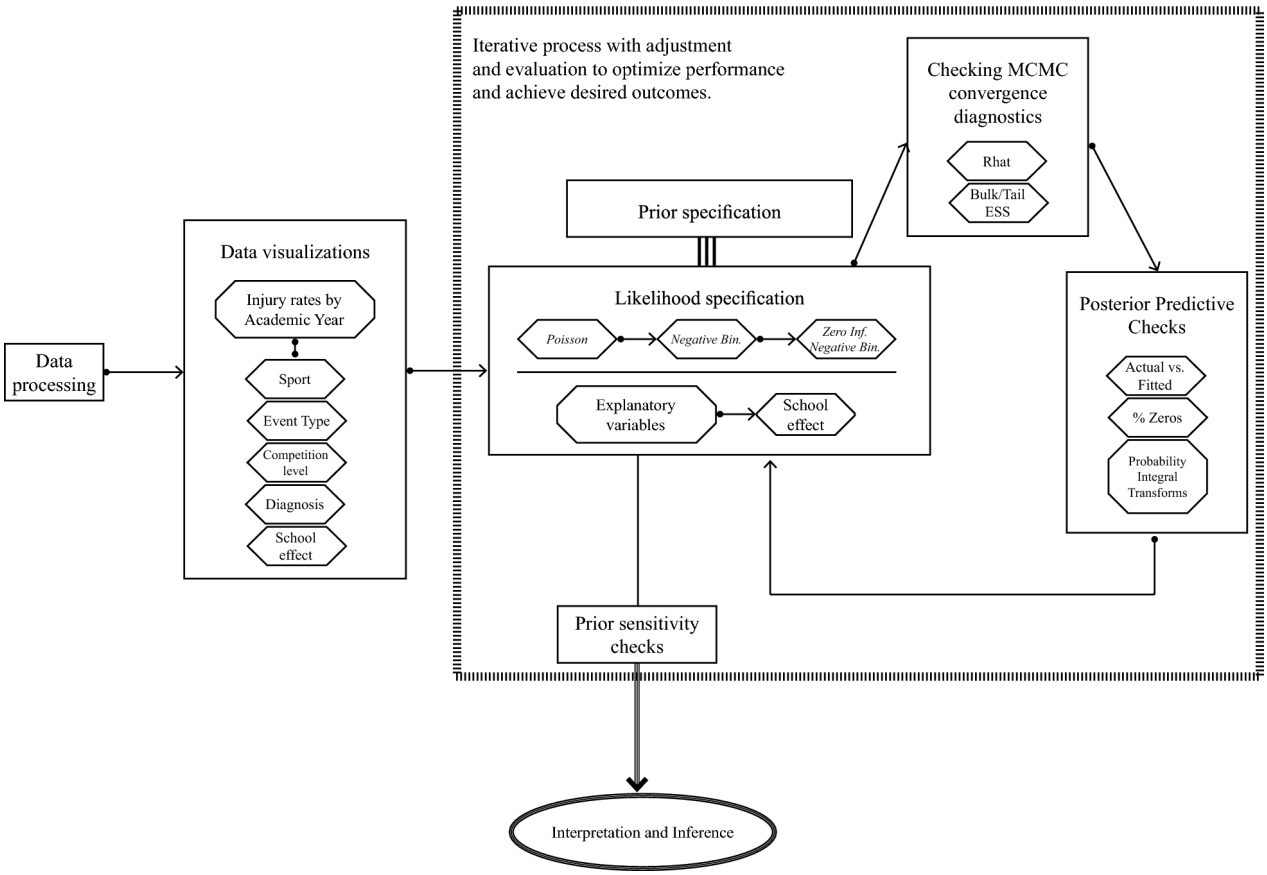
A newer study by Petway published this past March identified a set of 51 Achilles tendon ruptures by NBA athletes. The investigation looked at prior injury history in each and found that "thirty-five per cent (18) had previously missed at least one game for “Achilles tendinitis” or “Achilles tendon injury” on the side of the affected limb. A further 18% were noted to have suffered plantar fasciitis or foot inflammation (9) or previous ankle injury (9). Seven previous injuries were knee related, and five were described as calf muscle injuries. The remaining three had prior soft tissue injuries to the quadriceps, hamstring or groin." Tendonitis and associated tendon pain is among the most common athletic medical indications of an overuse situation.

Anecdotal information collected by Maria Lawson in an ESPN.com reports builds a strong case for the role of overuse in Achilles tears by NBA players. According to Lawson's source, Nirav Pandya, a

professor of orthopedic surgery at the University of California San Francisco, star basketball players in the NBA have increased their training and their injury exposure during playoff competition, on top of the "mileage" that started accumulating when they were young, "If you're looking at a calf muscle or the ligaments and tendons of the average 22-year-old player," he said, "they've already had so much mileage on them, compared to players 30 or 40 years ago who weren't doing that."

Petway writes in his second study that "understanding any potential association between previous small time-loss injuries and large time-loss injuries such Achilles tendon ruptures is an important step in advancing injury risk mitigation strategies in professional basketball." But he leaves the statistical work required to show causation to others. Fortunately there is good work underway though it does not specifically address ruptured Achilles tendons among elite (and overworked) basketball athletes.

Chandran et al. uses a Baynesian approach (diagram below) in his paper to calculate the injury rates of NCAA soccer players using data gathered in the NCAA injury surveillance system. According to the authors, "Injury rate is a common measure of injury occurrence in epidemiological surveillance and is used to express the incidence of injuries as a function of both the population at risk as well as at-risk exposure time." Normally a frequentist approach based solely on counts and ratios between injuries and injury exposures is standard method for sport injury epidemiology. The benefit of the Bayesian approach, according to the authors, is "incorporating prior beliefs enables the estimation of models with sparse data or complexities that frequentist methods alone cannot handle." Overuse, and its increasing prevalence among young athletes, are something that have a better chance of being reflected as analysts' gain understanding of injury priors affect on posterior probability distributions through iterations of estimates.



Another recent study by Australian sports researchers challenged traditional methods for calculating injury risk. The authors of "Next Generation Models for Subsequent Sports Injuries", Wu et al., write that those older models "relied on logistic regression and survival analysis, which can have limited ability to capture time-varying and cumulative effects." The authors chose to focus their attention on the subsequent injuries experienced by previously injured athletes, leveraging methods for subsequent analysis from a range of fields outside sports. Using data supplied by an Australian Football League team for one season the scientists were able to develop an injury prediction model using the team's performance tracking data. Athletes' ages was a model risk factor that could be anticipated outcome. Somewhat surprising was the number of 95+ percentile efforts that athletes were making during training and competition were a contributing factor to subsequent injuries. The paper's main method, to assess a subsequent event based on data analysis, is a promising path for understanding athletes' injury progression from moderate to catastrophic, like with the Haliburton Achilles tear.

Conclusions

The ruptured Achilles tendon experienced by Tyrese Haliburton during the 2025 NBA Championship was a singular event that has precedent, but not a certifiable root cause besides the general "overuse" that all of the very best professional basketball players experience. The challenge leading up to the injury event is the same challenge in specifying the risk of injury given the circumstances. Teams and athletes have the prerogative to not play in a game, and effectively take the risk (and the reward) out of the equation. But with the high stakes of playing for a championship that option would not seem to be available or acceptable. Monitoring systems that can better specify athletes' injury risk are making progress, but have a long way to go before such systems can affect decision-making. That said, the NBA promised to investigate the causes and impacts of the catastrophic Achilles tendon injuries that occurred to not just Haliburton, but also to other star NBA talents, Jayson Tatum and Damian Lillard. The public is likely to put injuries among top NBA players under a microscope during the next NBA regular season and playoffs. If a consensus forms that the NBA entertainment product is diminished in the eyes of fans because the best players do not or cannot participate in competitive games then it makes sense to expect significant energy and resources to technical and analytical solutions for injury risk monitoring. In the meantime, Tyrese Haliburton will not play any games during the next NBA season while he rehabilitates his injury.

References

Chandran, A., Clarsen, B., Varley, I., Khan, K., Marshall, S. W., & Bahr, R. (2025). The Practical Value of Bayesian Inference in Describing the Epidemiology of Sports Injuries. *Sports Medicine*. https://doi.org/10.1007/s40279-025-02312-4

Chandran, A., & Lambert, B. (2025). Bayesian methods for estimating injury rates in sport injury epidemiology. *Injury Epidemiology*, *12*(1), 31. https://doi.org/10.1186/s40621-025-00583-z

Jackson, J. (2025, June 29). Achilles injuries have vexed the NBA. A Hall of Famer reflects, and doctors analyze. *The New York Times*. https://www.nytimes.com/athletic/6453371/2025/06/29/nba-achilles-injuries-haliburton-tatum-lillard/

Lawson, M. (2025, June 25). *Experts cite overuse in spate of Achilles injuries in NBA*. ESPN.Com. https://www.espn.com/nba/story/_/id/45582778/nba-calf-achilles-injuries-overuse-recovery

Lemme, N. J., Li, N. Y., Kleiner, J. E., Tan, S., DeFroda, S. F., & Owens, B. D. (2019). Epidemiology and Video Analysis of Achilles Tendon Ruptures in the National Basketball Association. *The American Journal of Sports Medicine*, *47*(10), 2360–2366. https://doi.org/10.1177/0363546519858609

McCormick, B. (2025, August 25). Negative Steps and Achilles Tendon Ruptures [Substack newsletter]. *Hard2Guard Player Development Newsletter*. https://brianmccormick.substack.com/p/negative-steps-and-achilles-tendon

Petway, A. J., Burch, R. F., Saucier, D., Gillen, Z. M., Epsley, S., Forbes, R., Hurwitz, J., & King, J. (2025). Examining prior injury relative to Achilles tendon ruptures in National Basketball Association players. *Research in Sports Medicine*, *33*(5), 525–536. https://doi.org/10.1080/15438627.2025.2481894

Petway, A. J., Jordan, M. J., Epsley, S., & Anloague, P. (2022). Mechanisms of Achilles Tendon Rupture in National Basketball Association Players. *Journal of Applied Biomechanics*, *38*(6), 398–403. https://doi.org/10.1123/jab.2022-0088

Wu, P. P., Yu, Y. Y., Toohey, L. A., Drew, M., Sisson, S. A., Grazian, C., & Mengersen, K. (2025). Next Generation Models for Subsequent Sports Injuries. *Applied Stochastic Models in Business and Industry*, *41*(4), e70034. https://doi.org/10.1002/asmb.70034

Xergia, S. A., Tsarbou, C., Liveris, N. I., Hadjithoma, M., & Tzanetakou, I. P. (2023). Risk factors for Achilles tendon rupture: an updated systematic review. *The Physician and Sportsmedicine*, *51*(6), 506–516. https://doi.org/10.1080/00913847.2022.2085505