The Data Revolution in Baseball: Balancing Analytics and the Human Element

Logan Schuler

MI 304

Professor Ruth Shillair

November 24, 2025

Over the course of the past twenty years, Major League Baseball has undergone significant transformation. The use of technologies such as Statcast, TrackMan, and Rapsodo has made it possible for teams to acquire thousands of data points per second. These systems measure everything from spin rate to exit velocity, as well as defensive positioning and biomechanical efficiency. Rather than simply coaching and learning how to play the game, these technologies now make it possible to scout, plan, and assemble a team. This research paper investigates the ways in which baseball has been altered by data analytics, with a focus on performance, decision-making, and player health. It also examines how this analytical revolution challenges baseball's traditional reliance on human intuition. While analytics have changed the way players develop and teams strategize, an overreliance on them risks diminishing the creativity, individuality, and instincts that have always been integral to the sport.

Historically, decisions in baseball were often made based on personal knowledge, scouting reports, and intuition. Coaches, scouts, and front offices relied on what they observed and the information they gathered about a player's habits and potential. This intuitive approach dominated before the rise of the "Moneyball" era in the early 2000s. As Lewis (2003) described, the Oakland Athletics of that period used sabermetrics to identify undervalued players and compete despite limited resources.

Since then, analytics has expanded dramatically. What once revolved around basic calculations like on-base and slugging percentage now includes big data, artificial intelligence, and biomechanics. Contemporary baseball operates within a "performance science" framework that integrates data, sports medicine, and biomechanical research (Mizels, Erickson, & Chalmers, 2022). Open-access tools such as Statcast and Baseball

Savant have made it easier for teams, analysts, and fans to evaluate performance. Huang and Hsu (2021) argue that MLB's extensive statistical history makes it an ideal environment for big data analytics because nearly every in-game event can be quantified and compared across eras.

Statcast, introduced league-wide in 2015, is now the most important tool in baseball analytics. Using combined radar and optical tracking systems, it monitors nearly every on-field action. Metrics such as launch angle, hard-hit rate, sprint speed, spin rate, catch probability, and expected batting average provide highly accurate representations of player performance (Statcast | Glossary, 2021). These metrics give coaches clear benchmarks and allow analysts to build predictive models that highlight strengths, weaknesses, and opportunities for improvement.

TrackMan, a radar-based system, measures the three-dimensional movement of the ball. Its data include pitch speed, spin rate, release point, extension, and movement profiles. These measurements have had a transformative impact on modern pitching. According to Pourciau (2023), TrackMan has become essential in pitcher development because it allows players to instantly assess how changes in their mechanics affect ball movement.

Rapsodo provides similar measurements but in a more affordable and portable format. Because of this accessibility, high schools, colleges, minor league organizations, and training facilities can now use advanced analytics. Rapsodo gives athletes immediate feedback on their pitching or hitting metrics, helping them connect mechanical

adjustments to measurable outcomes (Williams, 2025). This broadens analytics beyond professional baseball and helps bridge the gap between amateur and elite levels.

Front offices use this data to build rosters, evaluate talent, negotiate contracts, and design player development strategies. Coaches use it to create individualized training plans. Lindbergh and Sawchik (2020) highlight that organizations are now focusing more on enhancing players' abilities rather than simply identifying undervalued talent, as emphasized in their book The MVP Machine.

Modern analytics also plays a significant role in athlete health. Wearable sensors and motion-capture technologies help medical and performance staff analyze joint stress, identify mechanical flaws, and estimate injury likelihood (Mizels et al., 2022). By merging biomechanics with data science, teams can create personalized training and recovery programs that protect pitchers from overuse injuries and help hitters refine their swings.

Predictive modeling has also become central to in-game strategy. Teams use Statcast data to optimize defensive positioning, evaluate pitcher–hitter matchups, and adjust game plans in real time. As Huang and Hsu (2021) note, open databases allow not only front offices but also independent analysts, universities, and fans to participate in the analytical ecosystem. Technologies like Rapsodo make advanced metrics available even to youth athletes, expanding the sport's analytical literacy.

Yet there are concerns that analytics may overshadow human judgment. Overemphasizing data risks reducing players to numbers while undervaluing traits like leadership, resilience, and baseball IQ. Mizels et al. (2022) warn that biomechanical and

performance-tracking data may pressure athletes to alter their training or physical attributes to fit analytical models, which could increase stress, encourage conformity, or even lead to unsafe training practices.

There are also ethical issues regarding data ownership and consent. Players may be required to share sensitive biometric information, and improper handling of this data could harm careers. Additionally, wealthier teams can afford cutting-edge technologies, proprietary models, and more powerful computing systems, potentially increasing the competitive gap between small- and large-market franchises (Huang & Hsu, 2021).

Ultimately, baseball is still played by human beings. Instincts, emotions, and creativity cannot be fully quantified, yet players and coaches regularly emphasize their importance. Lindbergh and Sawchik (2020) highlight the ongoing tension between traditional “old-school” approaches and modern “data-driven” methods. Some players perform best when relying on intuition rather than strictly following data. Preserving the game’s spontaneity and joy remains essential. No model can fully capture the human experience of competing, reading the field, or connecting with teammates.

The analytic revolution has transformed nearly every aspect of baseball—from performance evaluation and player development to strategic decision-making and injury prevention. However, these advancements come with challenges related to privacy, autonomy, competitive fairness, and the preservation of intuition. Analytics should enhance baseball, not replace the human elements that give the game its identity. The future success of baseball will depend on how effectively teams blend data-driven insights with the instincts, creativity, and emotional depth that define the sport. The

question is not whether analytics should shape the sport's future, but how to integrate them without compromising what makes baseball timeless.

Works Cited

Albert, J., & Baumer, B. S. (2018). Analyzing baseball data with R (2nd ed.). Chapman and Hall/CRC.

Huang, J.-H., & Hsu, Y.-C. (2021). A multidisciplinary perspective on publicly available sports data in the era of big data: A scoping review of the literature on Major League Baseball. SAGE Open, 11(4). https://doi.org/10.1177/21582440211061566

Lewis, M. (2003). Moneyball: The art of winning an unfair game. W. W. Norton & Company.

Lindbergh, B., & Sawchik, T. (2020). The MVP machine: How baseball's new nonconformists are using data to build better players. Basic Books.

Mizels, J., Erickson, B., & Chalmers, P. (2022). Current state of data and analytics research in baseball. Current Reviews in Musculoskeletal Medicine, 15, 283–290. https://doi.org/10.1007/s12178-022-09763-6

Pourciau, B. (2023). TrackMan for baseball. TopVelocity. https://www.topvelocity.net/2023/07/10/trackman-for-baseball/

Statcast | Glossary. (2025). MLB.com. https://www.mlb.com/glossary/statcast

Williams, K. (2025). Revolutionizing baseball analytics: Understanding Rapsodo. MoreThanSport.com. https://www.morethansport.com/revolutionizing-baseball-analytics-understanding-rapsodo/