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Hitting It Out of the Park: How Major League Baseball Changed the Game by Not Changing Anything at All

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Hitting It Out of the Park: How Major League Baseball Changed the Game by Not Changing
Anything at All

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Introduction

On Wednesday, September 4, 2002, the Oakland Athletics were preparing to host the Kansas City Royals—except this was not just a typical Wednesday night. The Athletics were on a nineteen-game winning streak, and one more win would vault them ahead of the 1947 New York Yankees and 1906 Chicago White Sox into the Major League Baseball (MLB) record books with the longest winning streak in American League (AL) history. Entering the night, Oakland led the season series against the Royals, though five out of eight games were decided by one run. (“2002 Oakland Athletics Schedule”) After scoring six runs in the first inning, one run in the second inning, and four runs in the third inning, the game felt like Oakland’s to lose. (“Royals vs. Athletics - Game Summary - September 4, 2002”) After all, it couldn’t be hard to protect an eleven-run lead over six innings since many different factors would have to conspire at once; but crazy things happen in sports. What the rest of that night had in store was so far out of left field, that nobody would have believed it until they saw it themselves.

Over the next five innings, the Royals scored eleven unanswered runs to tie the game by the bottom of the ninth. (“Royals vs. Athletics - Game Summary - September 4, 2002”) All hope seemed lost for the Athletics, as everyone thought they would suffer the largest comeback in MLB history and be remembered as the team that missed history in a historic way. After a leadoff fly out, manager Art Howe called on first baseman Scott Hatteberg to pinch-hit, needing any spark for a late rally with the goal being to put the winning run on first base. The lefty took a first-pitch ball from Kansas City reliever Jason Grimsley, and then sent the following pitch over the right-centerfield wall and transported everyone through one of the most romantic walk-off endings in Athletics and MLB history. (“Royals vs. Athletics - Game Summary - September 4,

2002”) The homerun gave Oakland a one-run victory to set the new AL record with twenty consecutive wins.

By the end of the season, they won 103 games and the AL West division title. Oakland felt confident entering the first round of the playoffs against the Minnesota Twins. Unfazed by regular season inferiority, the Twins defeated the Athletics in their best-of-five game series. A franchise that had been waiting since 1989 for a World Series title (and 1990 for an appearance) was forced to wait at least one more year to end either of these droughts (which are still active to date). On top of that, the Athletics have not won 100 games again since 2002. (“MLB Team History - Oakland Athletics Season Results”) As difficult as that is to do, since the 2002 season, MLB has seen twenty-four teams win at least 100 games, including fifteen since 2015. (“100-win seasons in Major League Baseball”) Evidently, teams have reached this milestone more frequently in the modern age than when analytical baseball was first born, demonstrating a positive relationship between attention to statistics and regular season success.

Nevertheless, the Athletics hit an unmatched high in the early 2000s and left some fans wondering what carried them to that point and why they haven’t repeated that success. The short answer is statistics; the long answer spans over 150 years through the history of professional baseball in the United States. However, the concept of analytical baseball never fully took shape in MLB until Oakland general manager Billy Beane acted on the simple objective of improving a lowly franchise.

To combat the inheritance of a subpar roster and low payroll, Beane became Oakland’s general manager entering the 1998 season needing to reshape the culture and find a new way to build a competitive team with meager resources. Luckily, he did not have to look far to find the next big thing: he just had to look where nobody else did. This is when data-driven baseball and

the “Moneyball” mindset were born. A seemingly simple concept in “identifying and using undervalued assets to create and sustain a competitive edge” suddenly changed the course of MLB. (“Billy Beane”) Beane challenged longstanding stereotypes surrounding scouting methods and talent evaluation by employing statistical strategies to find undiscovered, yet affordable advantages. In this, Beane trailblazed a league-wide trend of data mining as the desire, accessibility, and volume of baseball statistics reached unprecedented heights with advancing technology. Although, it is important to note that Beane was not the first man to incorporate statistics into baseball operations. He falls in a long line of proponents of an analytical movement that predates the creation of MLB in 1869.

In this paper, I will examine the integration of baseball into American culture and statistics’ involvement in that process. A consistent theme throughout the history of baseball in America is the application of data that educates and expands the sport’s national and global scope. MLB is the premier professional baseball league with thirty franchises and a myriad of ways in which numbers drive public absorption and appreciation of the sport. The numerous contributors to this movement each worked with what they had, which naturally increased over time, and all shared the presence of mind to turn an overlooked idea into a core element of a longtime staple of American sports history.

This chronology starts before the invention of computers and runs through the worldwide growth of technology, the dawn of “Moneyball” in the early twenty-first century, and the MLB’s implementation of Statcast and other new technology since 2015. There are no specific dates that precisely define these stages of the movement, but they are important because they reflect the evolving state of baseball and its broader connection to society.

This paper will paint a clear picture of the emergence and acceptance of analytics in baseball through a gradual transformation of the style of play spanning the past few decades in the form of increased strikeouts, homeruns, and extra-base hits. The effects of technology are evident, but credit for the intuition behind this movement goes to those that did not have nearly as many resources to work with. Before computers aided with calculating and storing standard and advanced metrics, a few passionate fans were relied upon to gather and communicate the meaning of numbers that explained what happened on the field. The capacity for understanding of the sport increased dramatically due to innovation driven by individual minds long before the presence of technology.

Furthermore, this paper will explore the polarizing implications of analytical baseball on and off the field. Nowadays, players have more insight than ever into their performance and mechanics in a game where statistics powerfully influence offensive and defensive approaches to every pitch. The overarching objective of adopting analytic-based strategies is to improve overall performance and win more games, but the saturation of data in baseball has invoked unintended consequences including slower pace of play, less on-field action, and a profoundly controversial product of baseball. One of the main questions that this paper will explore is whether or not MLB can go too far with its statistic-minded initiative (if it has not already). There are legitimate arguments on both sides of the current and projected power dynamic of analytics, sparking an ongoing conversation that puts MLB in a fragile position trying to balance traditional aspects of the sport with the modern data wave washing over it.

Literature Review

Professional baseball has long been dubbed as America's national pastime for its purity, symbolism, and sentiment of tradition cherished by fans. The sport was ingrained into American

culture in the early twentieth century after a commission was appointed to establish baseball as an American game and refute its alleged European roots. (Davies 54) This commission included two United States senators and was created under the recommendation of Albert Spalding, a former pitcher and manager for the Chicago White Stockings and founder of American sports equipment manufacturing company *Spalding*. They based their claims off of an old handwritten letter stating that the written rules of baseball were conceived in Cooperstown, New York (where the National Baseball Hall of Fame and Museum resides). (Davies 54) This countered more obvious facts that baseball came from overseas as an evolution of the English game “rounders”. Despite this historical ignorance, the patriotic element of this fabrication compelled Americans to accept this story over the European version and take pride in calling baseball their game. From there, it was only a matter of time before baseball became an immovable aspect of American life:

Over the years, baseball became intimately embedded in the American consciousness through the arts – theater, newspaper, song, film, radio, television, poetry, and novel. It also provided the medium for animated conversations (and arguments) in the daily flow of public and private discourse, and its images became embedded in the common language. (Davies 53)

Bartlett Giamatti was one individual who carried himself with the passionate spirit for baseball that invigorated many Americans. As a former commissioner of Organized Baseball and Boston Red Sox fan, Giamatti had skin in the game and understood the heart-wrenching lifestyle that came with having a favorite team. However, even when the Red Sox lost, his devotion to the game lived on due to the sport’s liveliness and seasonal synchrony: “ ‘It breaks your heart. It is designed to break your heart. The game begins in spring, when everything else begins again, and it blossoms in the summer, filling the afternoons and evenings, and then as soon as the chill rains come, it stops and leaves you in fall alone.’ ” (Davies 53) Giamatti knew as well as anyone how it felt to root for a favorite team and endure the up-and-down journey of a long season.

Close emotional attachment is a large part of what keeps people coming back to play or watch baseball. Every season presents a new window of opportunity and optimism with a blank slate. Opening Day, which is usually at the end of March or start of April, is often associated with images such as clean dirt, fresh trimmed grass, pure white baselines, and the natural beauty of the start of spring. Going to the ballpark to watch a game can be a meaningful experience for anyone—regardless of baseball knowledge—because of the perceived authenticity of the sport. While this consensus viewpoint was deliberately concocted at the expense of the history behind baseball’s arrival to America, it portrays a passionate national spirit and love for the game.

In addition to raw admiration, the other big factor that captures public interest is analytics that fuel a fascination for what happens beyond the field and enable deeper insight into the sport. MLB is placing statistics at the forefront of their marketing campaign in a society consumed by advanced technology. In 2014, the league partnered with Amazon Web Services (AWS) and their Statcast technology. (Kelly) Former AWS vice president of worldwide commercial sales Mike Clayville explained the company’s role in MLB’s efforts to make the game more engaging and interactive for fans:

‘MLB has been collecting statistical data on its players and clubs for decades, and turned to AWS in 2015 to take its game-day stats to the next level, so that fans can dig deeper into advanced metrics that ultimately enhance enjoyment of the game.’ ... ‘AWS has the broadest and deepest portfolio of cloud services with the best security and proven operational expertise, which is why MLB chose to work with the world's leading cloud to build, run and enhance Statcast™.’ (Kelly)

In 2018, AWS announced that it will continue its partnership with MLB on a deeper level by becoming the league’s official provider for machine learning, artificial intelligence, and deep learning workloads. Jason Gaedtke, MLB’s chief technology officer, explains how MLB chose AWS for “their strength, depth and proven expertise in delivering machine learning services.” (Kelly) This added technology helped MLB automate its record-keeping process for dynamic

sabermetric analysis that “ ‘[took] understanding of the game to a whole new level for... fans and the 30 clubs.’ ” (Kelly) Innovation like Statcast makes teams and fans much smarter with more statistics available at one’s fingertips than ever before.

A couple years later, MLB switched to Google Cloud as a new data and analytics partner. Commissioner Rob Manfred saw great potential in partnering with Google Cloud and their technology that could tap into a more personalized and immersive experience. This initiative was bolstered by the wondrous possibilities and power of real-time analytics in a world increasingly driven by data. The league’s commitment to Statcast was not lost with its AWS partnership, seeing as it has become “indispensable for fans, players, coaches, umpires, and broadcasters”. (“MLB”) In line with AWS, Google Cloud paid major dividends in using big data to make the common fan more knowledgeable and fascinated in baseball.

For as long as statistics have been involved in the sport, this has been a common theme as individuals and teams made discoveries and tested the bounds of tradition. This process was much more gradual before the twenty-first century for two main reasons: nonexistent or inferior technology, and it was harder to accept new theories that challenged longstanding structures and stereotypes. Statistics posed a threat to the familiar way of doing things—especially to managers and front offices featuring former players. This paper will traverse the extensive timeline from when statistical analysis was first applied to baseball to the positive and negative modern implications of data’s evolving presence and purpose in the sport.

Statistics Stepping Up to the Plate

Professional baseball was not always deeply rooted in the statistics that arise after every pitch and play. Baseball needed a push in the right direction to land on the map and make a

stronger impression among the American people. However, that push did not come from a fanatic of baseball with a lifelong passion or any prior background in the sport. Instead, the credit goes to an English cricket player that changed how fans understood the sport in a place where nobody thought to look: the numbers.

Henry Chadwick is the father of statistical analysis in baseball. He came to America from England at the age of twelve and became a famous cricket player in New York City. Later, he became a newspaper reporter covering local sports, which played into his discovery of baseball. In 1856, Chadwick saw a game between the Brooklyn Eagles and New York Gothams—two topnotch teams—and had a light bulb moment. Not only did he appreciate the talent of those teams, but also the value of baseball as a sport. In his *Sports in American Life: A History*, Richard Davies cites Chadwick's newfound passion for baseball: “ ‘The game was being sharply played on both sides and I watched it with deeper interest than any previous [baseball] match that I had seen... I was struck with the idea that [baseball] was just the game for a national sport for Americans.’ ” (Davies 58) Chadwick's conversion from cricket to baseball symbolized opposing trends for the two sports in the United States: cricket was waning, and it was only a matter of time before baseball take its place.

With this mindset, the most suitable strategy that Chadwick thought would help baseball grow was to use statistics to show how the game worked and thoroughly evaluate each player. After all, countable events converted into statistics are the most direct testament to players' talent because they turn on-field happenings into straightforward calculations from which to derive greater conclusions. In 1859, Chadwick introduced a box score displaying a detailed summary of each game. (Lewis 69) An improvement from the original invention of the box score in 1845, Chadwick's version included statistics like runs, hits, and errors, as well as an inning-by-inning

line score. (Davies 59) These figures are commonplace today but were innovative in the mid-nineteenth century. Syncing baseball with the changing times enabled its rise in popularity by responding to the call for a standardized system of rules and scoring. Chadwick served on a committee that established uniform rules for baseball that, under his influence, “settled on the number of innings that constituted a game (nine), the player roster (also nine) and how many balls and strikes were permitted.” (Martin) In 1860, he began editing *Beadle’s Dime Base-Ball Player*, an annual publication that chronicled everything Chadwick knew about baseball. This effort bore “baseball’s first statistician, [and] perhaps [Chadwick’s] most enduring contribution, because no sport places such a premium on statistics.” (Martin) While the types of statistics that teams valued changed over time, contemporary statistical models resemble Chadwick’s original concepts. Through his early contributions, Chadwick became the spark for a statistical revolution that would frame everyone’s perception of the game.

Analytics On (and In) the Air

After Chadwick’s breakthrough, baseball underwent several changes to make the sport more appealing to its fans as rules, language, and general understanding evolved over the years. The first game broadcasted on television was on August 26, 1939, and set into motion a “[fundamental] change [to] the relationship between sports and society.” (Maney) Baseball games had been recapped in newspapers since the end of the nineteenth century and broadcasted on the radio since the 1920s, but television greatly widened baseball’s audience by enabling fans to watch games from home. Technology moved forward such that “In 1950, 9 percent of U.S. homes had a TV. Only 12 years later, it was 90 percent.” (Maney) This innovation called for individuals with advanced knowledge of the game, such as former players and knowledgeable analysts, to commentate what happened on the field to inform viewers at home. During the early

stages of television broadcasts, which coincided with an expanding MLB fanbase, baseball saw its next great contributor towards the analytics movement on the field and in the broadcast booth.

Allan Roth brought forth a new perspective to baseball that paid major dividends towards teams' approaches and strategies and fans' absorption of the sport. The kickstart to Roth's career came when he joined the Brooklyn Dodgers as a statistician under president Branch Rickey.

(McCue) Roth wanted to track numerous statistics and categorize his findings to establish player trends and formulate smarter insights. A preliminary meeting with Rickey did not go very well, but a four-page letter detailing Roth's proposal opened Rickey's eyes to statistical ideologies that were not so outlandish. To Roth, " 'Baseball is a game of percentages—I try to find the actual percentage, which is constantly shifting, and apply it to the situation where it will do the [best].'"

(McCue) Unlike Chadwick, who tracked countable statistics dissected from watching games, Roth focused on unconventional statistics that changed behind the scenes.

If precedent suggested that statistics worked in a stop-and-go manner like the sport, then Roth upended that notion by setting data into perpetual motion. For example, he created the spray chart, which illustrates where players hit the ball using percentages. Batting average—an older statistic—strictly calculates the amount of hits from at-bats, whereas the spray chart takes every batted ball and returns frequencies of where the ball travels off the bat. This allows players and coaches to learn more about hitting tendencies. For instance, if a right-handed hitter hits several balls to the right side of the field, it likely means that his bat-speed is slow, and he needs to get around on the ball faster. In the modern world, spray charts are visually featured during several television broadcasts; but in the mid-1900s, this was an odd statistic that few people tracked not due to skepticism in its merits, but a lack of real evidence of its impact on player performance and team success.

In 1954, Roth was moved from the dugout to the broadcast booth, where he made strides providing commentators timely and informative data that created a newly interactive experience for fans at home and fellow broadcasters. It did not take long for Roth to catch the attention of Dodgers announcer Vin Scully, who was amazed by the wide range of questions that Roth could answer during games: “ ‘If you had some question that came to you in the middle of a game, he would reach down into the bag, and the next thing you knew you’d have your answer. It was marvelous.’ ” (McCue) Roth infused the typical fan’s viewpoint with different numbers and information to strengthen the viewer’s eye to comprehend more of what happened every play. This was pivotal to the analytics movement because it added a new dimension to the versatility of data from strictly benefitting teams and players to spectators that would not learn as much without it.

When Roth moved back to the dugout, a big difference emerged in how the team used his findings. Initially, Roth’s work only went to Rickey, the team president; now, managers and players incorporated his data towards game strategy and individual improvement. One particular application of Roth’s data was on September 18, 1959. Entering a doubleheader against the San Francisco Giants in which the Dodgers needed two wins for any chance at the World Series, manager Walt Alston planned on pitching Don Drysdale in the afternoon game and Roger Craig in the night game. (McCue) However, Roth raised the fact that Drysdale pitched considerably better at night than during the day, while Craig showed no significant difference. On that note, Alston switched Craig to the afternoon and Drysdale to the night. As a result, the Dodgers won both games that day, and later won the 1959 World Series. The Dodgers may have still won if Alston did not make this change, but Roth’s data presented evidence of the best projected path to victory and ultimately turned that projection into reality.

One player that used Roth's data was pitcher Sandy Koufax, who credited his integration of off-speed pitches and emphasis on first pitch strikes to spring training sessions with Roth in the early 1960s. (McCue) These sessions were worthwhile because from 1962 to 1966, Koufax was nearly unstoppable. He improved in several statistical metrics and led MLB in more of them in those five seasons than during his previous seven seasons. To name a few, he led the National League (NL) in earned run average, won the NL Cy Young Award three times (given to the best pitcher in the NL), and won or finished runner-up for the Most Valuable Player Award three times. ("Sandy Koufax Stats") Koufax was also inducted into the National Baseball Hall of Fame in 1972. When push comes to shove, the numbers never lie; it's how people use them that can make the greatest difference.

Looking back, it is no wonder that the Dodgers won the 1959 World Series, but this raises one question: Why had more teams not tried something like this before? The short answer is that there was no significant precedent. Roth was a trailblazer because he was one of the first statisticians to use television to expand the audience of his findings. He looked for any way that statistics could fuel competitive advantages on the field or educate viewers on the air. Roth sat in on national broadcasts for NBC and ABC and consulted for twenty major league teams, which is a lot considering that MLB never had thirty teams until 1998. His contributions vaulted MLB to new heights in performance, philosophy, and awareness. In the words of Bill James, an eventual proponent of this movement, " 'He was the guy who began it all' ... 'He took statisticians into a brave new world.' " (McCue) This was the beginning for analytics as people devised new ways to apply data towards baseball research that studied broader topics around the sport.

Sabermetric Studies Surge

While Roth took data to a whole new level, its practicality was limited until people found creative off-field applications for it. That changed after Robert Davids founded the Society for American Baseball Research (SABR) on August 10, 1971. (Thompson and Hufford) Davids received a journalism degree at the University of Missouri in 1949, and later became a freelance contributor to *The Sporting News*, a sports journalism publication. Davids' passion was baseball, but *The Sporting News* felt otherwise when transitioning to an all-sports publication and reducing baseball publishing efforts. In line with other efforts towards the continuance of baseball research, the call for an organization like SABR arose. Just less than a decade later, the Society became an entity after Davids wrote a letter on March 19, 1971, to thirty-two people interested in baseball research. The audience size was not important; rather, Davids' goal was to orchestrate a preliminary meeting at the National Baseball Hall of Fame with people who shared a passion for baseball. In the letter, he outlined the following objectives for Cooperstown:

(1) to see Cooperstown and the always changing Hall of Fame Museum; (2) to meet and exchange [first-hand] views with other [statisticians]; (3) to review specific areas of baseball interest to avoid duplication of effort; (4) to establish an informal group primarily for exchange of information; or (5) to establish a formal organization with officers, dues, a charter, annual meetings, etc.; (6) to consider the establishment of a publication in which our research efforts could be presented; and (7) to take up additional matters which you may suggest in response to this letter. (qtd. in Thompson and Hufford)

Fifteen people joined Davids in founding SABR and committed themselves to five overarching objectives that shaped the long-term future of the organization:

1. To foster the study of baseball as a significant American social and athletic institution.
2. To establish an accurate account of baseball through the years.
3. To facilitate the dissemination of baseball research information.
4. To stimulate the best interests of baseball as our national pastime.
5. To cooperate in safeguarding the proprietary interests of individual research efforts of members of the Society. (Thompson and Hufford)

Originally, not many people paid attention to this small group of baseball fanatics; now, membership exceeds 7,000 people, including “prominent authors, researchers, sabermetricians, former players and executives, and baseball fans.” (“Society for American Baseball Research”) As membership grew, so did the Society’s significance towards the baseball world. Its realm of research encompasses more than statistics: “SABR publishes other books on baseball and reprints some hard-to-find materials of high historical interest. SABR also hosts a number of specialized research committees dealing with specific topics.” (“Society for American Baseball Research”) Their biannual *Baseball Research Journal* contains expansive collections of original baseball research, and the SABR Baseball Biography Project collects biographies of all players and managers that have appeared in MLB, as well as other important individuals towards the history of baseball.

Additionally, the Society has expanded across American borders via regional chapters in places such as Canada, the United Kingdom, and Japan, which regularly exchange original research and personal anecdotes among those connected to the game. (“Society for American Baseball Research”) Since its founding day, SABR laid the groundwork for the exposure of baseball research beyond small gatherings like the one that founded the organization. Statistical analysis took off as membership of the Society symbolized a growing interest in baseball. In fact, SABR’s acronym inspired statistician Bill James to coin the term “sabermetrics” to define the study of baseball research. His original definition of sabermetrics was the “search for objective knowledge about baseball,” which is accurate considering how sabermetrics have evolved over the past few decades. (Rand) Statistics factor into baseball knowledge in many ways, and James’ research sought to generate a deeper apprehension of the sport by manually compiling data to discern messages communicated from the data.

Extracting the Potency of Statistics

Bill James pioneered the practicality of sabermetrics at the right time to enter the mainstream and exponentially grow. He studied economics and literature at the University of Kansas before falling in love with baseball to the point where everything he wrote somehow involved baseball: “ ‘I’d probably be a writer if there was no such thing as baseball,’ ... ‘but because there is such a thing as [baseball,] I can’t imagine writing about anything else.’ ” (Lewis 65) His first publication, *1977 Baseball Abstract: Featuring 18 Categories of Statistical Information That You Just Can’t Find Anywhere Else*, was essentially sixty-eight pages of baseball statistics. James’ annual *Baseball Abstract* publications became his way of expressing his perception of MLB. As he wrote in his *1985 Baseball Abstract*, he only cared about statistics because “baseball statistics, unlike the statistics in any other area, have acquired the powers of language.” (qtd. in Lewis, 64) The more that people use statistics, the more that those numbers come to life and influence how the game is understood; this, according to James, is where many go wrong.

Numbers directly attest to player performance, but people’s interpretations of them are skewed by subjective judgement of what they say—and have been for a long time. James had a unique philosophy of statistics, as Michael Lewis details in *Moneyball: The Art of Winning an Unfair Game*: “The statistics were not merely inadequate; they lied. And the lies they told led the people who ran [MLB] teams to misjudge their players, and mismanage their games.” (Lewis 67) Statistics do not say anything, yet people derive intuitive (sometimes misled) conclusions while giving them meaning towards winning and building better teams. Using statistics to win more games opens a Pandora’s box that propels the power of statistics to great heights:

‘When the numbers acquire the significance of language,’ ... ‘they acquire the power to do all of the things which language can do: to become fiction and drama and poetry. ... And it is not just baseball that these numbers, through a fractured mirror, describe. It is character. It is psychology... history... power... grace, glory, consistency, sacrifice, courage... success and failure... frustration and bad luck... ambition... overreaching... discipline. And it is victory and defeat, which is all that the idiot sub-conscious really understands.’ (Lewis 67)

James redefined what statistics conveyed by saying that they don’t convey anything at all.

Take the error, a statistic that reflects the number of times that players miss makeable plays.

According to James, if a player misses a makeable play, then he must have done something right to put himself in a proper position to make the play. That makes the error a statistic rooted in opinion. (Lewis 66) This argument makes sense because the fielder does something right in creating a manageable situation to make the correct play; while the miss is an error in execution, the statistic accounting for the error is recorded through the subjectivity of a scorekeeper judging the fielder’s ability in that moment. In this, the error is not an objective statistic beneficial for constructive analysis; rather, it is centered around the subjective assessment of occasional faults. This influences fans’ perceptions of what happens on defense by magnifying situational mistakes that detract from a more wholistic understanding of the game that accounts for everything else that happens on the field.

Dating back as far as Chadwick, spectators have compiled statistics to make sense of the unexplained and show what players do that factor into their performance. However, when people attach false meaning to statistics accrued through merely watching games, they lose objectivity by reaching intuitive conclusions that can misguide strategy and talent evaluation. Although he had less resources to work with, Chadwick instigated this misinterpretation by “creating a central role for statistics in baseball, but in doing [so creating] the greatest accounting scandal in professional sports.” (Lewis 71) In essence, James’ message is that people undermine their

intentions for using statistics, albeit unintentional, through the ways in which they value certain statistics over others.

Call to the (Technological) Bullpen

James experienced a slow start with his first *Baseball Abstract* in 1977, but advances in computer technology and a spike in players' salaries accelerated the awareness of his work. A considerable amount of the progress made with sabermetrics would not have happened nearly as rapidly—or been possible—without computers. Richard Schell examines the role of technology since 1971, the year that SABR was founded:

Sabermetrics developed alongside the information age, with personal computers enabling those who did not work where computers were... available to develop their algorithms and analyze data at home. The Internet spawned websites and blogs, connecting people and enabling them to gather and store vast amounts of data. Sabermetrics has gone from something a passionate few studied to something millions access and understand. (Schell)

The power of statistical analysis ultimately rests on the sample size of statistics to work with.

Computers quicken the processing and storage of big data and amplify the organization of vast amounts of statistics. SABR member George T. Wiley cited computers as “The most significant development in the use of statistics over the past 25 years” in an article published in the 1976 *Baseball Research Journal*. (Wiley) He notes the substantial impact of computers on statistical analysis below:

Mathematical computations that formerly took hours to do by hand are completed by the computer in seconds. Masses of statistical information are now being analyzed in ways never before thought possible. In addition, when such statistical information is extensive and uniformly organized, cause-effect relationships can be determined with amazing accuracy. Baseball statistics clearly fit the definition of ‘extensive and uniformly organized.’ (Wiley)

This rapid statistical expansion became even more vital when players' salaries increased because it enhanced the gravity of smarter financial decision-making. Assessments of players'

value affects how much teams choose to pay them. Data formulates more informed decisions because it paints a well-rounded picture of talent to complement what scouts and front offices see. The importance of wise financial and scouting decisions grew in proportion to the climb of team salary caps. With next-level insights, everybody eventually wanted whatever numbers they could get, though only a few immediately turned to analytics because it piloted unproven tactics that challenged expertise built on years of experience in the game. Fanatics and analysts practically salivated over this new data, but it took some convincing to get stubborn managers on board because it felt like an attack on their grasp of the game. This resistance remained a trend across most of MLB until one manager took a leap of faith that changed the direction of his organization and how the world viewed analytics.

Dawn of “Moneyball”

The 2002 season saw MLB’s first tangible domino effect of analytics. General manager Billy Beane and the Oakland Athletics piloted the implementation of analytical-based methods and first adopted the “Moneyball” approach. Beane had been in baseball for a long time, as it was his own experience that guided how he managed the Athletics. During his high school days, baseball scouts looked for five skills: running, throwing, fielding, hitting for contact, and hitting for power. (Lewis 1) Beane was a prototypical five-tool player, and this traditional mindset lured every scout towards Beane. Sky-high expectations carried him to the pros, but soon let him down after the New York Mets drafted him with the twenty-third pick in the 1980 MLB Draft. Nobody thought to look at Beane’s statistics, and that came back to bite the Mets after investing a high draft pick on him. Beane *looked* so good that “[Everyone] missed all the clues. They didn’t notice, for instance, that Billy’s batting average collapsed from over .500 in his junior year to just over .300 in his senior year.” (Lewis 9) In this, Beane’s own path taught him that there is

more to players' value than what meets the eye, and that was how he knew that traditional scouting was not going to tip the scales in Oakland.

Entering Beane's tenure, the classic assumption was that teams with larger payrolls could afford more experienced and higher-rated players and, thus, had better chances of success. The Athletics radically upended that notion: "In 1999, the A's ranked 11th of the 14 AL teams in payroll and fifth in games won. By 2002, its total payroll had fallen to 12th in the league, but the team had moved to first place in games won. The A's first-place spot was an unprecedented outcome." (Allen and Seaman) Beane trusted statistics from computers, primarily on-base percentage, and used them to create a more competitive team, identify undervalued players, and reach the playoffs despite a low budget. Since then, Moneyball became baseball's worst kept secret as teams raced to invest new resources and departments in sabermetrics. As if overnight, tradition was out, and analytics were in. As Bill James once said regarding analytical baseball, "It's happening, and it's not going to stop." (Rand) Thanks to modern technology and proof of success, that statement will long remain true.

The Numbers Game: How It Adds Up

Since 2002, analytics have only grown in the number of people using it and its practical applications. In 2014, MLB adopted an expanded replay review system; in 2015, the birth of the challenge system allowed managers to directly challenge umpires' calls and, if successful, overturn them. The league was late to adopt this rule compared to other professional sports, but it "opened the door into a [brand-new] arena of statistical analysis over 50 years in the making." (Imber) This makes strategy much more meaningful because an overturned call at the right time can swing momentum and potentially make the difference between victory and defeat.

Another new tactic is the defensive shift, which is when players abandon their ordinary positions to cover different parts of the field. Teams do this under the guidance of statistics that show particular parts of the field where certain players hit the ball more often. Managers also induce specific pitcher-hitter matchups more frequently thanks to data showing head-to-head advantages in certain situations. For example, a manager calling in a left-handed pitcher to throw against a left-handed hitter is an attempt to capitalize on a same-handed hitter-pitcher matchup that typically favors pitchers who can bend breaking balls away from hitters rather than towards them.

Moreover, teams have turned their franchises around from bad to good with the help of sabermetrics. The 2004 Boston Red Sox are one notable analytic-driven turnaround in the post-Moneyball era. The franchise had not won a World Series championship since 1918 nor made an appearance since 1986, and the superstitious “Curse of the Bambino” loomed over Boston for a long time. When Larry Lucchino became the team president in 2001, he hired Theo Epstein, the youngest general manager in MLB history, shortly before John Henry bought the Red Sox in 2002. After that season, the Red Sox hired Bill James as a senior advisor on Baseball Operations, symbolizing an embrace of analytics in this reconstruction of the front office. Two years later, they won the 2004 World Series and snapped their 86-year drought. James stayed with the Red Sox until the end of the 2019 season and saw them win four World Series titles—the last one occurring in 2018. A change in leadership guided by a statistic-minded philosophy led to a nearly immediate positive turnaround and reversal of fortune in Boston.

Outside of the stadium, the explosion of fantasy sports turned fans into coaches by simulating managers’ daily decisions with less pressure than the real job. In fantasy baseball leagues, anyone can draft rosters comprising players from different MLB teams in hopes of

deeper in numerous ways. Betting against the spread involves picking teams to win by a certain number of runs determined by sportsbooks who use encyclopedias of statistics to establish favorites and estimate how many runs they should win by. Over/under totals are estimates of how many runs will be scored in games. Several in-game bets can be placed as well, including how many hits players will record, how many strikeouts pitchers will amass, predicting the next pitch or its outcome, how many homeruns will occur, and several other possibilities with the multitude of things that can happen after each pitch. Insights that identify smarter bets aren't reached without the assistance of statistics, which sports betting operators like DraftKings and FanDuel need volumes of in order to facilitate fantasy sports contests and other creative betting opportunities. Big data is bigger than ever with legalized sports betting, as "the total sports betting revenue in the U.S. reached over one and a half billion U.S. dollars" in 2019. (Lock) In a nutshell, dynamic analytics and baseball will long coexist in the modern world.

However, amid the wonders and genius of analytics lie some detrimental effects that have presented themselves over the years. One such effect is slowing the game down by inducing more stoppages in addition to those built into the sport when managers make nitpick tactical moves that impede the flow of the sport. Off the field, executives are leaning on statistics to handle finances using data that suggests when players will become less productive in the future (rather than paying players based on proven performance). This is enhancing the microscope on players and redirecting money from their pockets to other team expenses. While statistics help players learn more about their strengths and weaknesses and those of their opponents, front offices are learning just as much. Although, statistics of recent seasons show how this is a steadily unhealthy trend for MLB: the surge of homeruns, extra-base hits, and strikeouts are powerful examples of data pushing its limits.

All in all, sabermetrics holds a strong grasp on baseball by molding the style of play and how fans can engage in the sport. There have been positive and negative effects of analytics, some taking longer than others to materialize. Nonetheless, it is important to understand the current state of MLB so that it can improve for everyone involved. Big data will continue to facilitate decision-making on several levels, but there is such a thing as too many numbers. With that being said, MLB must contain analytics' control over the sport to enable a healthy influence on the game without ruining the experience. Although, even with experimental rule changes that MLB can test in response to public unrest, there is only so much they can do to redirect the course of the sport. Whether it meant to or not, MLB contributed to enduring concerns that have altered the nature of baseball as we know it. The most apparent illustration of this drastic turn can be found in an explosive growth of strikeouts, homeruns, and extra-base hits that show no signs of slowing down for as long as MLB encourages it.

Can't Spell MLB Without "K"

While analytics have benefitted all MLB players, staff, and front offices, there is a case to be made that nobody has yielded stronger effects on performance from the diverse applications and insights of data than pitchers. Considering that hitters cannot do anything until pitchers make their deliveries, everything that unfolds on the field comes down to whether or not pitchers can sneak the ball past hitters. In an era driven by intelligent and actionable data, pitchers dictate the flow of baseball with a rippling effect that cuts much deeper than what fans see every game. The fallout from a league-wide strikeout rate that has increased every season since 2008 has created a controversial brand of baseball such that "The strikeout dilemma has MLB officials deeply concerned given it is the primary reason for the game's sluggish pace of play and its troublesome lack of action on certain nights." (Rogers, Kurkjian) By far, the strikeout phenomenon is the

game's biggest ailment as pitchers have access to next-level data and managers employ strategies that make pitchers more dominant.

Evidence of the plethora of strikeouts is easy to see through several historic statistics. The first few months of the 2021 regular season alone saw records fall in the face of unprecedented pitcher consistency and dominance:

[Shane] Bieber struck out more batters (68) through April than any other pitcher in history. He set a ... record for consecutive starts (20) with at least eight strikeouts... [Jacob] DeGrom set a record for strikeouts (48) through the first four starts of a season and tied [Nolan] Ryan's record for strikeouts (59) through the first five starts. Corbin Burnes of the Brewers set a record for 58 strikeouts between walks ... that record was broken four days later by Gerrit Cole, who ... made it 61 strikeouts between walks. Burnes still holds the... record for strikeouts (56) to start a season before issuing his first walk. Yankees closer Aroldis Chapman struck out 29 in his first 12 innings. He struck out nine batters for every hit allowed, but it still wasn't the best strikeout-to-hit ratio in the game. (Kurkjian)

Just as analytics gradually emerged onto the scene, so did the strikeouts. While pitchers are reaching new heights, the league has seen a multitude of signs to suggest that something like this was coming. Numerous other strange, but true, statistics illuminate the growth of strikeouts:

There were 94 100-strikeout seasons [for players] from 1900 to 1963. But in 2019, the last full, 162-game season before COVID-19 shortened the 2020 season, a sobering 171 players struck out 100 times. (Kurkjian)

In 1989, no pitcher had a start of 12 strikeouts and no walks. In 1990, there was one. It happened 24 times in 2019. (Kurkjian)

From 1900 to 1960, only 22 times did a team win a game despite its hitters striking out 15 times. In 2019, it happened 46 times. ... In 2020, the Tigers became the first team ever to win a game striking out 25 times. (Kurkjian)

In Game 7 of the 1960 World Series in which the Pirates beat the Yankees 10-9, there were no strikeouts. But in Game 1 of the Reds-Braves [2020] wild-card series... that went 13 innings, there were a combined 37 strikeouts. (Kurkjian)

In the 1980s, there were, on average, nine strikeouts per game. Now there are twice as many. In baseball history, there have been four games in which the teams combined for six or fewer hits and at least 30 strikeouts. One of those games happened in 2015, one in 2018 and two in April [2021]. (Kurkjian)

Days after the Phillies became the first team since 1996 to score two runs *on a strikeout*, the Orioles' John Means became the first pitcher to throw a no-hitter without a walk, hit batter or error. The only baserunner came on a strikeout/wild pitch. (Kurkjian)

In April [2021], there were 1,092 more strikeouts than hits, the largest such gap in any month in [MLB] history. ... In 2016, the percentage of plate appearances that ended in a strikeout was .211. It has risen, year by year -- .216, .223, .230, .234. [On May 19, 2021], it stands at .243. Those are... the six highest rates in [MLB] history. In 1968, the famed Year of the Pitcher, the K rate was only .158. (Kurkjian)

[In June 2021], the league-wide strikeout rate is hovering around 25%. To put that into context, that is the same as the career strikeout rates of Sandy Koufax and Nolan Ryan. On average, every pitcher is performing like two of the best of all time. (Rogers)

One main reason that strikeouts are increasingly normal occurrences is that pitchers are built stronger and smarter than ever before. The sport has seen many talented arms, but never such high league-wide average velocity. The past decade has shown tremendous change in velocity that makes it very difficult for hitters: “The average velocity for a four-seam fastball is 94; 10 years ago, it was 89. ... The difference between a [90-mph] fastball and 95 mph is night and day. The difference between 85 and 100 is a completely different game.” (Kurkjian) This uptick in velocity gives hitters less time to decide whether to swing at a pitch and forces them to swing harder and faster just to make contact. Velocity was not always a point of emphasis because it was not always widely publicized; as this changed, it forced hitters to study data of pitchers' velocities, spin rates, and pitch selection in particular situations. Data reveals information about pitchers' past tendencies, but it has minimal bearing on what pitchers will do in the future. At best, it becomes an educated guessing game that happens in the blink of an eye and “will always favor the man with the ball. The pitcher is proactive in the relationship, while the hitter is reactive. That's not going to change.” (Rogers) The other source of adversity for hitters lies in the fact that fastballs are not the only pitches gaining velocity.

While fastballs are becoming faster, breaking balls are not too far behind. Sliders, cutters, curveballs, changeups, splitters, or combinations of these pitches often mess with the minds of

hitters with elusive speed and movement. Long-time infielder Ryan Zimmerman has been playing since 2005 and can attest to the source of trouble for hitters that lies in the off-speed:

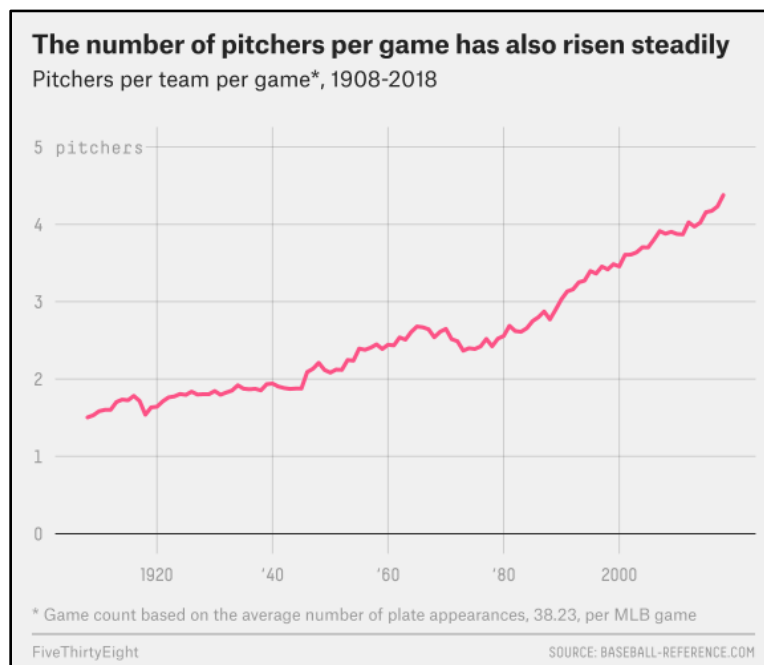
‘The secondary stuff is so ridiculous, and [pitchers] can throw it at any time; that’s what makes it so hard to hit,’ ... ‘These guys throw 95, 98 mph, but they only throw their fastball 40% of the time. It’s the combination of them throwing all their pitches in any count from the beginning. You used to have guys try to go through the lineup first time through throwing only a fastball. But now, from the first batter on, you might get the whole arsenal because if they get to 100 pitches, they are lucky.’ (Kurkjian)

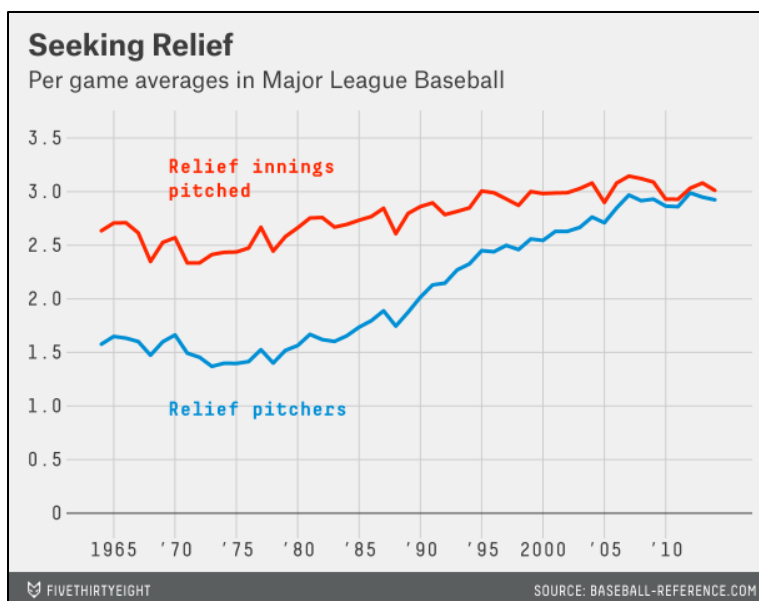
Pitchers can maximize the potential of their pitches by manipulating the spin rate and learning more about what their arms are capable of. Regular studies of statistics such as pitch velocity, movement, and usage rate show pitchers which types of pitches are effective and enables them to control their arsenals to surrender as few baserunners as possible.

On the other hand, even with advanced analytics at their disposal, hitters are somewhat helpless because “The remarkable amount of analytic data and ... technological advances have greatly helped pitchers improve arm speed, velocity, spin rate, etc.” such that hitters are typically a step behind pitchers. (Kurkjian) Jason Ochart, Philadelphia Phillies minor league hitting instructor and director of hitting at Driveline, a renowned baseball player development program, adds that “ ‘A pitcher’s development, the ability to leverage information and technology, has outraced the hitters significantly’ ... ‘Pitchers are using all this information to optimize an arsenal and a strategy against hitters.’ ” (Kurkjian) Hitting a baseball in MLB is one of the hardest things to do in professional sports, so this deeper mental puzzle makes it wonderous how offenses can score any runs when star pitchers are performing at elite levels.

Another reason why pitchers are increasingly effective is redefined objectives for starters and relievers that have made their arsenals much more elusive. Starters’ pitch counts and innings are tightly regulated by managers today, but before pitch count data was first tracked in 1988,

managers felt less pressure to pull starting pitchers because longer outings put less stress on bullpens that worked every game (as opposed to starters that pitched every five days). Every MLB season from 1988 to 2015 saw at least 100 complete games, signifying the magnitude of durability. Since 2017, no season has seen 60 complete games. (*Major League Pitching Year-by-Year Averages*) Once teams put more thought into limiting runs, durability took a backseat to effectiveness and strikeouts. Now, pitchers are asked to get hitters out with whatever it takes rather than conserve their arms long enough to see more of them. This strategy instigates more strenuous nightly efforts for bullpens, but that is not always a bad thing with several relievers on MLB rosters. The following figures visualize this ongoing trend that goes back over a century (Silver, Keri and Paine, Jaffe):





Starting Pitcher Performance 2015-20									
Season	IP/GS	Change	K%	BB%	HR/9	ERA	ERA-	FIP	FIP-
2015	5.81	-2.61%	19.5%	7.1%	1.06	4.10	103	4.03	102
2016	5.65	-2.8%	20.2%	7.7%	1.24	4.34	104	4.30	103
2017	5.51	-2.4%	20.6%	8.1%	1.34	4.49	103	4.48	103
2018	5.36	-2.8%	21.6%	8.0%	1.21	4.19	101	4.21	101
2019	5.18	-3.4%	22.3%	7.7%	1.44	4.54	101	4.51	100
2020	4.73	-8.7%	23.2%	8.6%	1.28	4.13	101	4.13	101

*2020 data through August 5, 2020.

Length of Starts, 2015-2020						
Season	≤1	1.1-2	2.1-3	3.1-4	4.1-5	≥5.1
2015	0.7%	1.8%	3.5%	6.3%	19.3%	68.4%
2016	0.8%	2.0%	3.6%	7.8%	21.8%	64.0%
2017	0.8%	2.0%	4.4%	9.4%	22.6%	60.8%
2018	2.0%	3.1%	4.4%	9.7%	23.8%	57.1%
2019	3.0%	4.0%	5.4%	10.5%	24.9%	52.2%
2020	1.8%	5.4%	8.7%	19.3%	25.6%	39.2%

*2020 data through August 5, 2020.

Early Season Starting Pitcher Workloads and Performance, 2015-20									
Season	GS	IP/GS	Change	TBF/GS	Change	Pitches/GS	Change	ERA-	FIP-
2015	338	5.72	-2.1%	24.2	-2.4%	91.3	-4.1%	102	103
2016	332	5.67	-0.9%	24.1	-0.4%	92.9	1.7%	98	96
2017	342	5.56	-1.8%	23.5	-2.5%	90.6	-2.4%	92	99
2018	324	5.38	-3.3%	22.9	-2.4%	89.5	-1.2%	96	100
2019	334	5.20	-3.4%	22.1	-3.6%	86.7	-3.2%	95	98
2020	332	4.73	-9.0%	19.8	-10.4%	77.8	-10.2%	101	101

*2020 data through August 5, 2020.

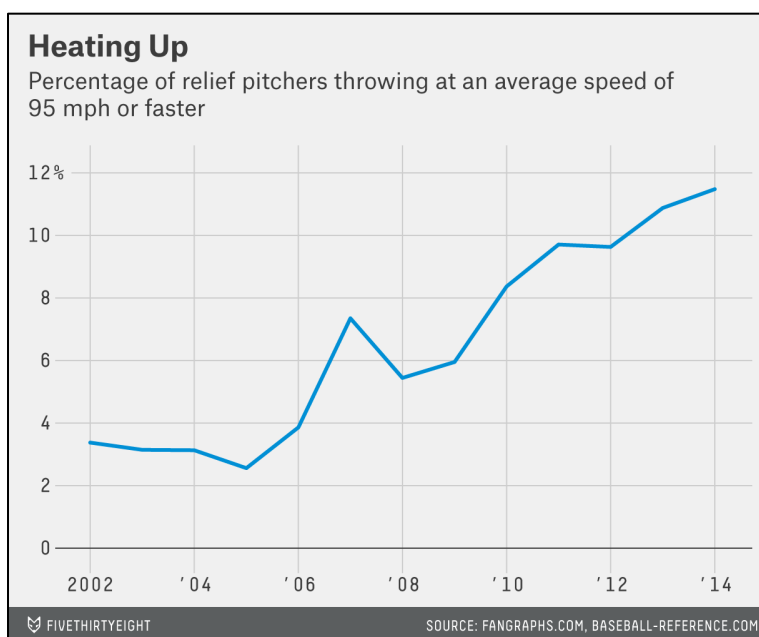
Factors that encourage managers to use more pitchers include pitch count management (whether recovering from injury or simply managing workloads), reducing familiarity of any particular pitcher for the opponent, an abundance of serviceable players to step into the role, and strikeouts. When starters don't pitch deep into games, they can exert more effort into each pitch knowing that the manager might pull them at any moment, which is increasingly quicker:

The average starting pitcher threw 95 pitches per start from 2001 to 2015. From 2016 to 2020, that number dropped to 89. Leaving a starter in long enough to face the same lineup for a third time has now evolved into heresy for all but the very best. The pitchers themselves have gradually relented, a begrudging acceptance that numbers cannot be defeated. Rather than engage in an unwinnable fight, they have attempted to use the strategy to their benefit -- by not being afraid to showcase all their pitches in early at-bats, by dismissing the idea of setting up hitters for the late stages of a game and... by going as close to max effort as possible. (ESPN.com)

Former baseball executive Theo Epstein, who was responsible for analytic-based turnarounds with the Boston Red Sox and Chicago Cubs that ended eighty-six and 108-year World Series droughts, explains the converted mentality of the starting pitcher:

'If you asked a starting pitcher thirty years ago, 'What's your job?' he'd say to finish this game or get close to it,' ... 'If you ask some starting pitchers now... fewer would say my job is to get deep into the game. It's more, 'I want to be as effective as possible, miss as many bats as possible, strike out as many as possible, and if the manager has to come get me in the fifth or sixth inning, so be it. We literally have eight to nine guys in the pen that can throw 98 mph and punch some guys out and finish the game.'" (Kurkjian)

MLB rosters comprise twenty-six players with no limit to how many pitchers teams can carry. Typically, teams have about twelve to thirteen position players and thirteen to fourteen pitchers, so five-man starting rotations leave about eight to nine relievers that can enter games with fresh arms and throw as hard as (if not harder than) their predecessors. The strategy of using many relievers in games disables opponents from becoming familiar with any pitcher's arsenal and elevates average velocity to keep it difficult for hitters to put balls into play. The following figure illustrates the spike of relief pitchers throwing at average speeds of 95 mph or faster from 2002 to 2014 and emphasizes how dominant bullpens increase the league-wide strikeout rate: (Keri and Paine)



In response to this adjustment by managers and pitching staffs, hitters had to undergo one of their own to not look completely impotent at the plate. They not only have to worry about getting the bat around quickly, but also finding open places to hit the ball. With more defensive shifts, that task becomes difficult when fielders abandon their original positions to areas where the ball is more likely to be hit. Before the shift was born, “left-handed batters [had] more

favorable matchups because they face right-handed pitching more than righties do left-handed pitching. Then came along the shift, and [lefty] hitters suddenly became vulnerable.”

(ESPN.com) While righty hitters can beat out ground balls to the hole near shortstop, lefty hitters have to deal with more infielders on the right side of second base. Shifts have considerably increased since they were first tracked in 2016, and more so for left-handed hitters than right-handed hitters: (“MLB Team Fielder Positioning”)

Year	TOTAL			vs. RIGHT-HANDED HITTERS			vs. LEFT-HANDED HITTERS		
	PA	Shifts	Shift %	PA	Shifts	Shift %	PA	Shifts	Shift %
2021	180199	55595	30.9	107506	17395	16.2	72693	38200	52.5
2020	66180	22549	34.1	37925	8208	21.6	28255	14341	50.8
2019	184392	47178	25.6	108892	15548	14.3	75500	31630	41.9
2018	183433	31927	17.4	108123	9597	8.9	75310	22330	29.7
2017	183135	22143	12.1	108084	5574	5.2	75051	16569	22.1
2016	179121	24464	13.7	105184	6516	6.2	73937	17948	24.3

As defenses commit to shifts and close off gaps for hits, this prompts a stronger effort from hitters to elevate the ball over the shift. Launch angle, exit velocity, and slug percentage are among the most preached statistics because contact hits up the middle now play into shifts and induce easier outs. Long-time catcher Stephen Vogt can attest to the hitter’s reshaped mentality that guides the effort to counter shifts: “ ‘There is no more shortening up and making contact. We are being told to drive the ball. We are using our ‘A’ swing on every pitch. When [teams] are preaching slugging and driving the ball, the pitchers are trying to strike you out. It’s the perfect storm. ... Shortening up and putting the ball in play is rarely spoken of today.’ ” (Kurkjian) Ryan Zimmerman agrees with the futility of poking hits where fielders aren’t because shifts defeat that purpose: “ ‘The balls that used to sneak up the middle, and... through the 6-hole, those don’t exist anymore... So you try to hit it over the shift. You might as well try to get an extra-base hit, but extra-base hits lead to more strikeouts.’ ” (Kurkjian) Hitters are adopting a homerun-or-strikeout

philosophy and accepting strikeouts in the pursuit of homeruns and extra-base hits because “analytics say a strikeout is nothing more than an out, no less damaging than a weak ground ball to the second baseman. And it’s better than hitting into a double play.” (Kurkjian) There is less humiliation in striking out because it is inevitable when hitters are trying to—and succeeding in—hitting more homeruns and extra base hits.

Extra Distance and Extra Bases

Approaches centered around launch angle, exit velocity, slugging percentage, and other metrics that encourage power-hitting are achieving positive results for hitters through record-high homerun totals. The top teams on MLB’s all-time single-season homerun list reveal an increasingly transparent trend in modern baseball: (Thornburg and Kelly)

<u>Rk</u>	<u>Year</u>	<u>Team</u>	<u>Homeruns</u>
1	2019	Twins	307
2	2019	Yankees	306
3	2019	Astros	288
4	2019	Dodgers	279
5	2018	Yankees	267
6	1997	Mariners	264
7	2005	Rangers	260
T8	2019	Athletics	257
T8	2010	Blue Jays	257
T8	1996	Orioles	257

One noteworthy observation is how each of the top five teams are from 2018 or later, and the 2019 season alone comprises half of the list. The 1997 Seattle Mariners held an MLB record of 264 homeruns for twenty-one years, but then the 2018 New York Yankees that passed the Mariners were outdone by four teams (including themselves) the following season. (Thornburg and Kelly) This data points to an exponential growth of homeruns that has become a natural, yet captivating, side effect of the spike in strikeouts. With fewer contact hitters, the frequency and

distance of high-flying hits are soaring as players meticulously craft and practice swings with the perfect launch angle to maintain some consistency with big hits.

Although, the ball does not have to sail over the fence for players to yield desired results, as evidenced by an inflation of extra-base hits. At-bats where hitters swing for optimal launch angles and don't strike out result in either homeruns, deep fly balls that stay in play, pop-outs that elevate the ball too much, or ground balls that don't elevate the ball at all. The four classes of batted balls and associated launch angles are pop ups (greater than fifty degrees), fly balls (twenty-five to fifty degrees), line drives (ten to twenty-five degrees), and ground balls (less than ten degrees). (*Launch Angle (LA)*) Players routinely feed into this boom-or-bust possibility under the idea that big hits outweigh the cost of striking out even though the latter happens much more often than the former. While doubles and triples have seen general declines as of late, statistics spanning the last decade provide evidence of the steadying normality of extra-base hits and their impact on other metrics of interest: (*2021 Major League Baseball Season Summary*)

Year	Hits	2B	3B	HR	XBH	% XBH	SO	BA	OBP	SLG	OPS
2021	1316	262	22	198	482	0.366	1405	0.244	0.317	0.411	0.728
2020	481	94	8	77	179	0.372	520	0.245	0.322	0.418	0.740
2019	1401	284	26	226	536	0.383	1427	0.252	0.323	0.435	0.758
2018	1367	275	28	186	489	0.358	1374	0.248	0.318	0.409	0.728
2017	1407	280	27	204	511	0.363	1337	0.255	0.324	0.426	0.750
2016	1409	275	29	187	491	0.348	1299	0.255	0.322	0.417	0.739
2015	1404	275	31	164	470	0.335	1248	0.254	0.317	0.405	0.721
2014	1387	271	28	140	439	0.317	1248	0.251	0.314	0.386	0.700
2013	1403	274	26	155	455	0.324	1224	0.253	0.318	0.396	0.714
2012	1402	275	31	164	470	0.335	1214	0.255	0.319	0.405	0.724
2011	1409	280	30	152	462	0.328	1150	0.255	0.321	0.399	0.720

This table contains yearly average batting statistics, including ratios of average extra-base hits to total hits. One significant takeaway from this data is that every season from 2015 to 2021

saw at least one-third of hits result in extra bases, meaning that the goal of hitting the ball out of shifts' reach is being met. Hitting for contact is seldom the plan of attack as power-hitting and smooth swings are widely promoted over their respective counterparts. Hitters are putting more time and effort into perfecting their swings, though it is becoming difficult to find diversity in hitters' swings because they "have beautiful swings, but... only one swing. If a pitcher throws it in his bat path, the hitter doesn't just hit a line-drive single to left field. He hits it 20 rows up. But if the pitcher identifies and avoids that one bat path, he doesn't just get him out, he strikes him out." (Kurkjian) This factors into the reformed mindset of each plate appearance by helping hitters come to terms with pitchers' dominance in at-bats that become tests of not just wit, but survival. Traditional methodologies have little space in today's game as analytics establish a new league identity that redefines our understanding of the sport. How MLB chooses to handle the controversy surrounding the widespread ripple effect of analytics will be interesting to see, but they are certainly trying their best with a slew of looming challenges on their plate.

What's Next for MLB

The future of baseball hangs in the balance of MLB's assessment of its state of flux. As analytics progressively ingrain a go-big-or-go-home style of play with little room in between, the league is forced to confront important questions and options to alleviate public dismay over what has become of the sport. The consensus on the state of MLB wants a brand of baseball that is more resemblant of the values that boosted its popularity before the data age, and the league is actively listening to an audience that speaks with a clear and unified message:

Major League Baseball has spent a lot of time and energy asking fans what version of the game they like the most. The results have given those in charge of the sport a clear mandate that leaving the game as is simply [isn't] an option. No fan is voting for more strikeouts. Or time between pitches. Or more pitching changes. ... 'three favorites at games are triples, doubles and stolen bases.' All three are down across MLB. (Rogers)

Baseball knows what it cannot be, but it is asking a lot to change what MLB stands for in a flash. Experiments are underway to combat concerns regarding pace of play, length of games, lack of hits, and other topics that circle back to the heightened homerun and extra-base hit tolls across the league. Minor League Baseball has become a sizeable platform for MLB to test different theories and proposals.

One such test lies in moving the pitching mound back by one foot to sixty-one feet, six inches, which MLB exercised in the independent Pioneer League. The theory here is that pushing the pitching mound back will aid hitters' reaction times and increase opportunity to make more contact against higher velocities. (Rogers) However, this compromises the sacred nature of the sixty-feet, six-inch pitching mound measurement that has become a staple of the sport. A second test involves making the bases bigger, which was used in Triple-A baseball this season; this rule change "could have an immense impact on everything from the number of infield hits and stolen bases to rosters more balanced between power hitters and those capable of taking an extra base." (Rogers) It would benefit hitters in close plays at bases by providing more space to evade tags or beat out dribbling infield hits while encouraging small-ball tactics that would provide changes of pace from homeruns or strikeouts.

Another rule under testing is regulating defensive shifts, which may bring about a double-edged sword if implemented beyond Double-A baseball. More contact hits would occur, but the rule may also open a can of worms impacting future generations: "Regulating the shift... will undoubtedly affect how many balls that currently end up in a fielder's glove get through for hits. But it could also fundamentally change a part of baseball. It might not just mean more baseballs getting through to the outfield, it could alter swing paths and habits of players and even the type of prospects teams [that] target in the draft." (Rogers) A once genius tactic to reduce hits raced to

levels of usage that are widely perceived as excessive or too far removed from the authentic feel of baseball. Moreover, growing discontent with umpire performance launched a call for robotic umpires to iron out inconsistencies with the strike zone. Be that as it may, the intention of correcting calls behind the plate would be just the beginning of what robotic umpires would accomplish. Theo Epstein claims: “ ‘You’re seeing the ABS [automated balls and strikes] being used in the low minors... because with that comes the potential to change the strike zone to one that is optimal for contact,’ ... ‘Different strike zones lead to different styles of play.’ ” (Rogers) Reconfiguring the strike zone carries game-changing implications, which is why using minor leagues as guinea pigs is ideal for this theory to weigh all of the effects and determine if it is appropriate for the big diamond.

Everything is in play as MLB gauges the feasibility of several possible fixes to prevalent problems within the game. In that comes opportunity for creative thinking with a safety net that prevents premature results from materializing on the field. MLB must not change everything, but rather be careful and selective in bringing about meaningful (positive) change. One thing MLB knows is that the future of the sport hangs in the balance of their conduct in the present:

The past and the future intersect in the present, and baseball’s present is confusing... This is the time to examine not only what baseball is now but also what it wants to be... that’s the sort of thing that will drive the decision-makers, the people who are supposed to be the game’s stewards. For... all of its foibles, baseball’s greatness remains on display every night, from April to October. It is the century-old house with good bones. But upgrades are necessary. Change is imperative. And it’s incumbent on all the game’s stakeholders, from those on the field to those in the ivory towers to those in the stands, to find a shared vision that best fits the modern expectation of what a professional sports league can and should look like. (ESPN.com)

Amid the depth behind record-breaking strikeouts, homerun, and extra-base hit totals—and the role of analytics in these transformative trends—MLB has become a fascinating case study through no intent of its own. Statistics and technology provided the tools for teams to redefine

the standard of professional baseball and challenge some of the major pillars that the game has long been built on. Any course of action that MLB pursues will certainly involve data in its cause and/or effects as analytics will continue to clench a strong hold on America's national pastime.

Conclusion

Statistics have rewritten the script of MLB—most markedly in the twenty-first century—and revolutionized how the mind visualizes, follows, and plays the game. Anyone can easily tap into an analytical side of baseball that is opening up new opportunities on and off the field. Data sits at the forefront of innovation reflected in enhanced player performance, managerial intellect, front office awareness, and fan engagement. However, early proponents of statistical analysis in baseball did not need the technology that we have today to extract the value of statistics. While machine power enables greater distribution and consumption of big data, it was never necessary to identify the underlying messages of statistics and give them practical meaning and importance in the sport. Henry Chadwick, Allan Roth, Bill James, and several others in and around their time recognized the intelligence and actionable nature of baseball statistics without the presence or capabilities of modern technology.

Although, a major caveat of combining deeper analytics and MLB in a tech-savvy world lies in data's seemingly limitless functionality and versatility. It is understandable to ponder and test the bounds of big data, but people must not forget the intangible factors that gave rise to the analytical revolution in the first place. Genuine brainpower laid the groundwork for statistical analysis, but is growingly overlooked for automated techniques to learn more about the game. The IQ of players, team personnel, and spectators have become vastly more aware and intuitive, but recent trends across MLB are showing how it is possible to have too much of a good thing.

Homeruns, strikeouts, extra-base hits, and a multitude of proposals to restructure a sport in extraordinary flux call for a step back to truly comprehend what is happening in baseball.

Many of the challenges currently facing MLB circle back to how the league has chosen to incorporate analytics into its operations. The beginning of the twenty-first century marked a clear turning point in the purpose that statistics served, which was reflected through many positive and negative consequences of a dynamic transformation of MLB. It is virtually impossible to restrict the league's access to big data because it is available on too many platforms to fully regulate, which is why patience and open-mindedness are essential towards creating a desirable version of MLB different from what we are witnessing.

In that spirit, it is important to understand that the solutions that MLB and its fans want will unlikely come to fruition in an elegant manner any time soon. Not only is today's style of play appealing to pitchers and hitters on the field, but the example that the league is setting for upcoming generations is quite impressionable in that Little League players idolize the flash and sensation of today's young stars. Additionally, growing up in a world that will likely have more advanced technology than this one will make it harder to not be attracted to cutting-edge analytics that so profoundly expand the baseball mind-space as it is. Data will hold a firm place in baseball for a long time, though it will always be within control to check how far it goes in dictating the brand of baseball produced and its effects on how everyone can experience it.

Regardless of what MLB and the future standard of baseball become, moderation is key towards creating a version of the sport that appeases everyone. The league must not cave to the pressure of producing substantial change immediately because there may be bigger implications at stake that cannot be realized until they ensue on the field. Using Minor League Baseball as an experimental platform is smart and resourceful for testing various ideas because it preserves the

current nature of MLB if they don't pan out well in the minors. Grievances cited from Triple- and Double-A leagues can be duly noted by MLB for future reference with what does or doesn't work in real-life.

It is clear that the decisions that MLB makes now will shape its long-term future. That is where research and questioning like that of this paper will continually serve an integral role in controlling that future. I originally took on this topic of research because of my personal attachment to baseball, but developing a greater understanding of the depth behind statistics and the consequences of how people use data has powerfully revealed the greater stakes at play. As long as humans remain curious to test the bounds of what is possible—not just in baseball, but society altogether—reflection and self-restraint will remain vital in knowing where we are to properly understand where we can or should go. History has undoubtedly shown that analytics and baseball can coexist, and continued investigation into the relationship between the two will aid people's efforts in maximizing what the sport can become for players, managers, executives, and fans everywhere.

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