THE SPORT JOURNAL™

Examining Perceptions of Baseball's Eras: A Statistical Comparison

October 25, 2018

THE SPORT JOURNAL

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ABSTRACT

Professional baseball has endured many changes in rules, equipment, and competitive strategy over the course of its history. Because of such shifts, the modern era of Major League Baseball has been segmented into distinct eras. The purpose of this research was to determine how the perceptions of each era compared with the statistical outputs based on the measure of On-Base Plus Slugging Percentage (OPS), beginning with the 1901 season. Results were segmented by each era to determine any significant differences between the eras. Multiple regression and ANOVA were used to determine if perceptions for each era aligned with statistical findings. Results showed that perceptions for five of the seven eras matched, while perceptions of two eras did not. Results also showed significant statistical differences between the eras, indicating the way in which hitting and pitching contributed to winning percentage were unique for each era.

INTRODUCTION

Over the course of baseball history, the economics of the game have dictated that management practices change with technology, explaining the current trend in the game towards using empirical data with sophisticated statistical analysis to aid in decision making. At the heart of the decision-making process is the attempt to assess which players will make the greatest impact on a team's chances of winning. We use the bevy of statistics available to both understand the history of baseball and attempt to predict its future. More than any other sport, the history of the game is referenced when talking about anything that is happening in the present. As author and baseball historian Stanley Cohen declared: "Baseball, almost alone among our sports, traffics unashamedly and gloriously in nostalgia, for only baseball understands time and treats it with respect. The history of other sports seems to begin anew with each generation, but baseball, that wondrous myth of twentieth century America, gets passed on like an inheritance" (6). Therefore, to understand baseball, one must understand both the history of the game and the economic drivers that lead to changes in the game on the field.

Baseball has endured much change over the course of its history, and because of constant change, the modern era of baseball has been segmented into six distinct sub-eras. A common list presented at Baseball-Reference described the eras as the Dead Ball Era (1901-1919), the Live Ball Era (1920-1941), the Integration Era (1942-1960), the Expansion Era (1961-1976), the Free Agency Era (1977-1993) and the Long Ball/Steroid Era (1994-2005) (17). This study runs through the 2011 season and a seventh era will be added and labeled the Post Steroid Era (2006-2011).

Each of the seven eras that comprise the modern era of Major League Baseball (MLB) is defined by the perception of how games were won during the particular era. Hitting and pitching statistics were analyzed in the present study. There have been great advancements in metrics to determine defensive performance, but they still face great criticism as to their reliability, and as such, are not included in the present study (7). Focusing primarily on hitting and pitching has merit, as pitching has been found to explain two-thirds of the variance in winning percentage while hitting explains the other third, with no mention of defense (19). The problem, then, is to determine whether hitting or pitching contributed more towards winning percentage in a given era. The statistics represent an objective view of what happened, while determining perceptions is a much more subjective process. An overview of each era is necessary in order to understand the perceptions that make each era unique. Those answers could then be compared to the perceptions of baseball historians for each of the given eras and expand the body of knowledge of baseball history.

Statistics tied to winning percentage present themselves as most relevant, with many studies having analyzed variables that correlate to winning percentage in MLB (22). Studies examining the relationship of both offensive and pitching statistics fall in line with the focus of

this study as they help explain what is happening on the field that affects winning percentage. The current study uses On-Base Plus Slugging Percentage (OPS) to measure both hitting and pitching's contributions to winning percentage because of its strong correlation to winning percentage (1, 20). OPS is desirable in this setting because it provides the ability to be used as both as offensive and pitching statistic, as it can be calculated for hitters or against pitchers. This allows the measurement of hitting and pitching on common ground. In order to properly assess the perceptions of each era, interpretations of each from baseball writers and historians are examined.

The Dead Ball Era (1901-1919)
Two specific rule changes favoring pitchers highlight the beginning of the Dead Ball Era. First, the size and width of home plate was changed from a 12 inch square base to a five-sided figure measuring 17 inches across, making the strike zone much larger (24). Second, foul balls began counting as strikes, which had been a heavy advantage for hitters (24). The impact of these rule changes was significant, thus: "with the larger plate and the new foul ball strike rule, strikeouts jumped more than 50 percent, while batting averages, home runs, slugging percentages, and runs per game sank to all-time lows" (24). It is thus argued, "The game belonged to the pitcher. The parks were large and lacked the enclosures which could invite the long ball" (21).

In addition to the rules, "the ball was so dead that hardly anyone could slug it into the stands" (25). This argument is backed by the fact that the St. Louis Cardinals hit a major league leading 39 home runs, as a team, in 1901. By way of comparison, the recently concluded 2017 season saw seven individual players hit thirty-nine or more home runs. The last non-strike-shortened season which saw the MLB home run leader hit less than thirty-nine occurred in 1976. As such, baseball historians and writers present the Dead Ball Era as a game dominated by pitchers.

The Live Ball Era (1920-1941)
There were many factors that led to drastic changes in the Live Ball era, but the focus of the changes was quite clear: "Beginning with the AL's 1920 season, the hitters went on a rampage that continued through the 1941 season" (24). "Trick" pitches, such as the spitball and the emery ball were abolished and an extreme effort was made to keep clean balls in play that the hitters could now clearly see (21). More importantly, baseball made a conscious switch in construction of the ball – the game now featured a "live ball".

The result was an immediate increase in home runs, as Babe Ruth alone hit 54 in 1920. Ruth had led baseball with 29 home runs in 1919, and only five other players had even cracked double-digits that year. Quite succinctly put: "The advent of power hitting did more than alter the face of the game. With its coming was the imbalance that is inevitable with such a drastic change. Those who paid the heaviest price were baseball's minority breed, the pitcher. Once a feared and revered figure, he became the object of many a cannon blast" (21). Only five years later, MLB went a step further and introduced an even livelier ball:

"based on the theory that fans prefer home runs to pitching duels" (23). In fact: "When the owners discovered that fans liked to see home runs, and when the foundations of the game were simultaneously imperiled by disgrace, then there was no turning back. In 1925 a new 'cushioned cork center' ball was introduced, perhaps more lively than those before it, and offense was allowed to dominate (13). Immediately following this change, Babe Ruth would hit 60 home runs in the 1927 season to establish a record that would stand until 1961. It was an important revelation to the owners that the fans enjoyed an offensive game. A review of the era clearly shows that baseball historians agree that hitting dominated pitching in the Live Ball Era.

The Integration Era (1942-1960)

It is important to note that the Integration Era begins in 1942 – five years before baseball actually integrated black players. The reason for marking the beginning of the era in 1942 is because the United States' entry into World War II affected MLB greatly. A total of 1,363 players, managers, coaches and umpires from the major and minor leagues served in World War II, including 29 Hall of Famers. This meant that replacement players at all levels had to fill in the rosters and the quality of play was arguably diluted as a result (4). Offensive averages took a slight downturn as compared to the live ball era, but due to its popularity with fans and changes by the players, home runs continued to rise. The perception of the era is aptly described:

> The pitcher's plight, as it had begun in 1920, did not improve. Instead, it only got worse as light bats became the mainstay of the batter's arsenal. Armed with a light weapon that responded to a good pair of wrists that could help negate the blazing fastball, the batter was able to continue his dominance over the pitcher. The result was that choking up on the bat became a rarity and nearly everyone went for the pump, or home run (21).

Baseball had presumably found the recipe to keep fans coming in droves: let black players in the majors, keep belting home runs, and continue allowing hitting to dominate pitching.

The Expansion Era (1961-1976)

The expansion era is appropriately named due to expansion in numbers of teams, locations, and types of players. By 1976, MLB had increased from 16 to 24 teams and invaded previously untapped markets such as California, Texas, Atlanta, Minnesota, Seattle (briefly) and even Canada. In addition to the team expansion, the establishment of black and Latin players led to a different game full of new stars (21). Rule changes continued to set the precedent for changes on the field. For the 1963 season, the strike zone was officially redefined – it had extended from the armpits to the top of the knees. It now extended from the shoulders to the bottom of the knee. This redefinition led to immediate changes:

> For a brief interlude, the six seasons of 1963 through 1968, pitchers regained an ascendancy over the hitters that they had not enjoyed since the first two decades of the twentieth century. Although batting averages had been slipping downward prior to 1963, in the 1963 season major league run totals fell by 1,681, home runs by 297, batting averages by 12 points, and bases on balls by 1,345. Pitchers recorded 1,206 more strikeouts than in 1962 (24).

Baseball historians claim that in the 1963 season: "Baseball's second dead-ball era had begun" (13). Baseball was not happy with this trend and responded in 1969 by lowering the mound from 15 inches above home plate to 10 inches above home plate. Additionally, the slope of the mound was defined and the height and slope rules would be strictly enforced (13).

In a continuing effort to raise offensive numbers the American League began using a Designated Hitter (DH) in 1973. The creation of the DH is argued as one of the most radical in baseball history because one entire league would not accept it. The AL, however, adopted it in hopes to add a spark to sagging offensive numbers and entice more fans to attend AL games (18). Expansion alone does not favor hitting or pitching, rather, it works to create a shortage of both. As a result, some contend that there was a great balance between pitching and hitting in the 1970's (13). Alternatively, and because of the six year period where pitching clearly dominated, others claimed that: "Pitchers had assumed control and command of the game as they had at no time since the pre-Ruthian era of the dead ball" (6). It is clear that hitting did not dominate for the entirety of the expansion era, but there appears to be no clear consensus as to whether the era as a whole was dominated by pitching or if it was simply balanced.

The Free Agency Era (1977-1993)
The foundations for free agency were established in 1966 with the MLB Players Association hiring Marvin Miller to be its executive director. Free agency marked a complete upheaval of a structure that had remained relatively unchanged for almost a century. In the first year twenty-four players became free agents, headlined by Reggie Jackson who signed a five-year $3 million deal with the Yankees. Players saw immediate results in the form of their salaries, and by 1979 the average salary was six times what it had been in 1966 (14). There was a clear change in how the game was structured, and similar to the last half of the expansion era, the rules on the field again favored the hitters as runs per game rose and offense was perceived to have dominated pitching.

The Steroid Era (1994-2005)
The irony of the Steroid Era is that it begins after steroids made it on MLB's banned substance list (1991), but continues past the time that MLB actually began testing major league players (2003). As baseball came back from the player's strike in 1994, attendance declined rapidly. A strong argument is made that: "Steroids may have saved baseball after the 1994-1995 strike, [as the strike] angered fans and resulted in attendance dropping by

almost 10 million in both the National and American leagues" (14). MLB needed a way to bring fans back to the parks, and it was not until the famed Home Run Race between Mark McGwire and Sammy Sosa in 1998 that attendance numbers recovered. For this reason, the argument has been made that MLB allowed steroid use to go unchecked, and therefore allowed an explosion of offensive numbers.

They may have chosen to ignore it, but the evidence was apparent. Offensive numbers were up across the board, and in 1996 alone three separate teams broke their single-season home run records (9). The sharp increase in offensive performance remained at relatively high levels through the 2008 season (12). From the gathered works of baseball historians and statisticians alike, it is agreed that hitting dominated pitching in the steroids era.

Post-Steroid Era (2006-present)
There are two main factors for adding the Post-Steroid Era. First, beginning with the 2006 season, the penalties for testing positive for steroids (or any banned substance) became harsher than ever before (3). The 2006 season saw the implementation of a system where a player received a 50-game ban for a first offense, a 100-game ban for a second offense, and a lifetime ban for a third offense. The policy was again updated in 2014, and now includes an 80-game ban for a first offense, a 162-game ban for a second offense, and a lifetime ban for a third offense. Since 2012, a total of 30 players have been suspended for PED usage, including one lifetime ban. It is not a Post-Steroid Era in the sense that steroids have been removed from the game, but the idea is that the harsher penalties help deter players from using because the consequences are greater than ever.

The second factor that led to labeling the period since 2006 as the Post-Steroid Era is the resurgence of pitching. The 2010 season in MLB was frequently referred to as "The Year of the Pitcher" (5). This is a distinction that was also given to the 1968 season, which led to the immediate and dramatic changes to the pitcher's mound in the Expansion Era. For only the third time in MLB history, six no-hitters were thrown in 2010. During the 2012 season, seven no-hitters were thrown including three perfect games. The resurrection of pitching dominance and its correlation to harsher penalties for steroids appear to be more than a coincidence.

The Case for On-Base Plus Slugging Percentage (OPS)
Bill James' Pythagorean Percentage is widely considered the most accurate for predicting winning percentage: "At the team level, a good measure of offense should have a strong correlation with runs scored. This means that it should be possible to predict runs scored reasonably well from the measure; the best teams by this measure should score a lot of runs, while the worst teams should score very few" (8). Therefore, finding the best statistics to predict a difference between runs scored and runs allowed provides powerful information in order to build a winning team.

In the popular book Moneyball, former Oakland Athletics general manager Sandy Alderson relays that scoring runs is much more a product of on-base and slugging percentages, than the traditional batting average (16). Alderson's claim that batting average does not have a strong correlation with runs scored is confirmed, as it is common for the team with the best batting average to be below average in runs scored (8). The argument is further strengthened by the findings that: "Two statistics explain the bulk of the variance in winning percentage across teams: the team's on-base percentage and its slugging percentage, relative to the same percentages it allows for opponents" (11). On-base percentage (OBP) measures a player's ability to reach base and Slugging Percentage (SLG) distinguishes between different hit values and calculates the average number of bases reached for each at-bat. On-base plus slugging percentage (OPS) is simply the addition of OBP and SLG and has been found to be a superior statistic due to its high correlation to scoring runs (1, 2, 10, 19). OPS is typically viewed as an offensive statistic as it measures offensive output, but by calculating OPS Against (OPSa) for a team's pitching staff it can be used as a pitching statistic. This allows direct comparison of the same statistic so that the impact of offense and pitching can be measured on the same scale.

The purpose of the present study was to use the statistics of OPS and OPSa as a league-wide measure to determine if the perceptions of each era in MLB history aligns with the statistics. OPS represents a measure of hitting, while OPSa represents a measure of pitching. By using OPS and OPSa, conclusions can be drawn as to whether hitting or pitching contributed more heavily to winning percentage in a given era. Additionally, the present study discovered whether there were significant differences in the contribution of hitting and pitching between the eras.

METHODS
Data for team-level OPS and OPSa was collected from MLB.com's statistical database. Each era was designated as a number for the purpose of sorting, starting with the Dead Ball Era as era 1 and the Post-Steroid Era as era 7. IBM SPSS (22.0) was used for all analyses. During data collection it became apparent that some of the sought after data was not available. Prior to the 1950 season, the key statistic of OPSa was not available. After an exhaustive search it was confirmed by baseball-reference.com that the statistic is not available because prior to 1950 MLB did not officially track doubles and triples against individual pitchers, making it impossible to accurately calculate slugging percentage against (SLGa); rendering it impossible to calculate OPSa prior to 1950.

Rather than cut out the data prior to 1950, On-Base Percentage Against (OBPa) was tested as an alternative to OPSa. Several studies have concluded that OBP is a better predictor of winning percentage than SLG, as it has been found to be roughly twice as important (20). An analysis found that the coefficients for OBP are more than twice as large as the coefficients for SLG (10). In a subsequent study, the same researchers found that the coefficients for OBP range anywhere from 2.4 to 3.1 times more important than SLG for various periods they

examined. As a result of this, they concluded that: "the relative contribution of OBP to winning is about twice that of Slugging, for the sample as a whole, and in every sub-period as well" (11).

Knowing that OBP is a better predictor of winning percentage compared to SLG still did not answer the question of whether it represents a viable replacement of OPSa. OBP has been suggested as a viable replacement as: "OBP appears to be at least on par with OPS in predicting runs scored for nineteenth century teams" (2). Thus, a Pearson correlation was run between OBPa and OPSa for the data from 1950-2011 in order to test if OBPa could be considered a viable replacement. The test resulted in a correlation of $R2 = .797$ between OBPa and OPSa, positioning OBPa as a viable replacement for OPSa, when not available.

Separate multiple regression analyses were run to first determine the significance of both OPS and OPSa/OBPa on winning percentage for the entire modern era (1901-2011). The first analysis was run for the years 1950-2011 when OPSa was available, the second analysis was run from 1901-1949 when OPSa was not available, and therefore OBPa was used as a replacement. The final part of the analysis was constructed with the purpose of comparing hitting (OPS) and pitching (OPSa/OBPa) directly and was done in a two-step process. First, an ANOVA for OPS, OPSa/OBPa, and Era was run with three separate models. Model 1 included OPS and Era; Model 2 included OPSa/OBPa and Era; Model 3 was a full model including OPS, OPSa/OBPa, and Era. Interactions were also analyzed as part of the ANOVA to determine if the differences between the Eras were significant. Then, as part of each model, correlations were run, sorting the cases by era, to return Pearson Correlations between OPS and winning percentage and OPSa/OBPa and winning percentage for each era. Using these correlations, hitting and pitching could be compared directly, within each era, to determine which was more influential to winning percentage.

In the process of running these analyses, it was realized that the Integration Era was split in half by the availability of OPSa. In order to measure pitching by the same statistic for the entire era, OBPa was substituted for OPSa for the entire era. This distinction was implemented for the ANOVAs and accompanying correlations that were run to compare eras.

RESULTS
The first step was to determine whether OPS was a significant predictor of winning percentage in the modern era, because if not, the remainder of the study would have been moot. This check of significance was determined through two separate multiple regression analyses. Table 1 illustrates that all of the statistics being used for the analysis are significant at the .001 level. OPS has a positive correlation with winning percentage because it is a hitting statistic. Conversely, OPSa/OBPa is negatively correlated with winning percentage because it is a pitching statistic. For the period of 1950-2011, OPS and OPSa showed nearly the exact same correlation as each other to winning percentage. Despite potential differences in eras throughout this time period, as a whole, hitting and pitching has contributed almost equally to winning baseball games since 1950. Although the observed

correlation for OBPa at -.091 is not as strong as the correlation for OPSa, at -.466, it is still a significant predictor. The difference in R2 values from the 1950-2011 period (.788) and the 1901-1949 period (.247) possibly reflect the difference made by substituting OBPa for OPSa.

Table 1: Multiple Regression with Pearson Correlations

Year	OPS	OPSa
1950-2011	.467***	-.466***
	OPS	OBPa
1901-1949	.435***	-.091***

***$p<.001$

Note: For 1950-2011 R^2 = .788, for 1901-1949 R^2 = .247

Note: Pearson Correlation between OPSa and OBPa = .893

ANOVA

With the multiple regression returning significant results, the differences in the eras themselves by the significant measures of OPS and OPSa/OBPa were examined. Table 2 illustrates that each of the models provides results that are significant at least at the .05 level, with many significant at the .001 level. The interactions display that the differences between the seven eras are, in fact, significant. The way in which hitting and pitching contributed to winning percentage in each era is unique.

Table 2: ANOVA p-value results for OPS, OPSa/OBPa, and Era

	Model 1	Model 2	Model 3
Era	0.043	<.001	0.001
OPS	<.001	...	<.001
OPSa/OBPa	...	<.001	<.001
Era*OPS	0.032	...	0.002
Era*OPSa/OBPa	...	<.001	<.001

Note: Model 1 R^2 = .332, Model 2 R^2 = .355, Model 3 R^2 = .790

The significant interaction in Model 1 suggests that the way in which OPS affects winning percentage depends on the era of observation. The significant interaction in Model 2 demonstrates that the way in which OPSa/OBPa affects winning percentage depends on the era of observation. Model 3 demonstrates that when both statistics are included in this full model, the interactions are still significant. The fact that the interactions stay significant when both statistics are included in the model signifies that each statistic is a different phenomenon. It is not simply the same thing looked at from different sides. This is important because it allows a more confident comparison of the statistics within each era and between each of the eras.

Pearson Correlations

Pearson correlations for OPS and OPSa/OBPa for each era allowed direct comparison to determine whether hitting or pitching contributed more towards winning percentage in each era. Table 3 illustrates the Pearson correlations for OPS and OPSa/OBPa for each era. All correlations are significant at the .001 level. It can be determined which statistic contributed more to winning percentage in each era by simply comparing the absolute values of the correlations from Table 3, with the higher of the correlations contributing more.

Table 3: Pearson Correlations to Winning %

Era	OPS	OPSa/OBPa
1	.540***	-.619***
2	.603***	-.615***
3	.643***	-.616***
4	.553***	-.548***
5	.554***	-.507***
6	.567***	-.644***
7	.522***	-.564***

***$p < .001$

The Dead Ball Era

The correlation between OPSa/OBPa and winning percentage (-.619) in the Dead Ball Era is stronger than that of OPS and winning percentage (.540), suggesting that pitching was more important than hitting in this era based on its contribution to winning percentage. The disparity between the two is the largest in any era. This corresponds with the perception that the Dead Ball Era was dominated by pitching.

The Live Ball Era

The correlation between OPSa/OBPa and winning percentage (-.615) in the Live Ball Era is stronger than that of OPS and winning percentage (.603). This suggests that pitching contributed more to winning percentage than did hitting. The perception is that hitting drove the Live Ball Era, but the statistics show that pitching was more important to winning baseball games.

The Integration Era

The Integration Era is the first era of modern baseball where hitting was more important than pitching, as evidence of the correlation of OPS and winning percentage (.643) being higher than that of OPSa/OBPa and winning percentage (-.616).

The Expansion Era

The Expansion Era exhibits the closest correlations of any of the observed eras, as the correlation for OPS (.553) is only slightly larger than that of OPSa/OBPa (-.548). The small

discrepancy between the two lends weight to the perception that hitting and pitching were quite equal throughout the era. It suggests that hitting contributed more to winning percentage.

The Free Agency Era

The Free Agency Era shows hitting (.554) contributing more to winning percentage than pitching (-.507). As it was in the two eras preceding it, hitting contributed more to winning percentage than pitching in the Free Agency Era. This suggests that the perception of hitting being more important is correct.

The Steroid Era

The difference in correlations for OPSa/OBPa and winning percentage (-.644) and OPS and winning percentage (.567) is not only the second largest discrepancy of any era, but it does not align with the perception of the era. The -.644 correlation between OPSa/OBPa and winning percentage represents the single largest correlation for either stat in any era, as well as the single largest change in correlation from one era to another. Offensive numbers may have skyrocketed in the steroid era, but the present study suggests pitching had a stronger correlation to winning percentage.

The Post-Steroid Era

The differences in correlations for OPSa/OBPa and winning percentage (-.564) and for OPS and winning percentage (.522) show that pitching contributed more to winning percentage than hitting. Not only was pitching more important than hitting from 2006-2011, in line with perceptions; but hitting observed the lowest correlation to winning percentage as compared to any other time in the modern era.

DISCUSSION

The results of the analyses provided several intriguing outcomes as they are compared to what is typically understood about each era. In all, statistics in five of the seven eras aligned with their perceptions, while the Live Ball and Steroid Era were contradicted. It would appear more than coincidental that the two eras touted as the most offensively prolific were the two in which the statistics did not match up with the perceptions. Perhaps an explosion of offensive output somehow seems 'sexier' than a game dominated by pitching, so hitting is romanticized.

The perception that offense was the catalyst in the Steroid Era appears to be refuted by the statistics. With the era almost exclusively labeled as an offensively driven era, empirical data showing that pitching contributed more towards winning percentage is a fascinating finding. It is interesting that while pitching in the Post-Steroid Era shows a larger contribution to winning percentage than hitting does, it is still a large drop from the correlation observed in the Steroid Era. This would seem to support a belief that the Steroid Era represented a miscalculation about the dichotomy of importance between pitching and hitting.

The way in which a baseball game is termed may lend some insight into how the public views displays of both offense and pitching. High-scoring games in general elicit the loudest cheers and are often referred to by terms such as "barn burners," or offensive explosions. The connotation associated with a highly offensive game is exciting, or exhilarating. Conversely, a game featuring a superb pitching matchup is referred to as a "pitcher's duel". The term implies that the game will showcase a struggle and will be void of the excitement of an offensive-laden game. With little to no offensive output, many view such a game as boring and monotonous as hitters are continually set down in order.

It is also possible that the hitting was so much better across the board in these eras that the teams who could simply field a decent pitching staff enjoyed a significant advantage. It seems like more than a happenstance, though, that the eras in which the differences are perceived either in favor of pitching, slightly in favor of hitting, or equal between the two are the eras in which the statistics match up with the perceptions. Future studies should focus on how pitching truly differed between the eras to determine this. Also, a future study might include ballpark factors, which would normalize differences in where games were played.

CONCLUSIONS

As the application of statistics becomes more ingrained in sports it is likely that we will continue to see past assumptions questioned and challenged. The present study implies that an incomplete perception of past performance does not shield the near past. The largest observed discrepancy in the present study's results occurred a mere 10-20 years ago. A finding such as this should embolden researchers to continually examine our conclusions, especially as new measurement tools gain acceptance. It is important to note that no statistic can fully capture what is observed on the field. Clearly put, no statistic measures 100% of winning percentage. There are always factors beyond what is being studied. By no means does this study represent the only way to measure the importance of hitting and pitching in baseball. With continued growth in the use of sabermetrics as a tool for making baseball decisions there is a plethora of statistics available that can be used to predict winning percentage.

APPLICATIONS IN SPORT

The present study can serve as a reminder to all sports the importance of researching and checking what we think we know against what we can prove. As technology has increased and increased our ability to record statistics, it has become increasingly evident that we have often used the wrong methods of evaluating performance – sometimes by choice, sometimes by ignorance, and sometimes because we're simply not aware of the best measurement tool. While baseball is often credited as starting the "analytical movement" in present day sports, it is undeniable that every sport is changing the way it evaluates decisions at league, team, and individual athlete levels. Vital to this shift in evaluation is identifying the best methods by testing them against what has historically been employed. In this way, we use the historical data at our disposal to aid in making better decisions going forward.

This is not always an easy task, as we may uncover issues about the past which we would rather not bring to light. This is apparent in micro issues such as how we train athletes, how we evaluate athletes, and how we handle athlete safety issues. It is also present in macro issues such as how a team is constructed, how a league is run, and how we society views athletics. Comparing historical data and results with new methods of analysis has radically changed many of these issues.

Specifically in a sport like baseball which has a heavy reliance on its past in order to evaluate its present and future, it should be acknowledged that the history of the game will continue to be re-written. As we collect better information and discern better ways of evaluating it, our assessment of the past will change. This will (and already has been) be met with resistance. It is important to continue exploring these areas, because it can eventually lead to better decision-making. It is these explorations that lead to meaningful changes at multiple levels of sport.

ACKNOWLEDGMENTS

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