Original Research

OFFENSIVE TENDENCIES OF MAJOR LEAGUE BASEBALL TEAMS, REGULAR SEASON VERSUS POSTSEASON

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ABSTRACT

Within baseball, performance analysis has been widespread for many years, and comparisons between players using key performance indicators (KPI) have been a popular discussion point between fans, those involved in the competition of the sport and academics. With long periods of inactivity between instances of play, the sport lends itself well to sports performance analysis, and the statistics produced often have an impact on the decisions of coaches. In this study, the differences in aggression levels of offensive behaviours in Major League Baseball (MLB) teams in the regular season, compared with the postseason, were analysed with a view to finding differences in the mode of scoring or changes in baserunning habits. The research question seeks to determine whether there is a change in the offensive tendencies of players in the postseason as compared with the regular season.

INTRODUCTION

Due to the highly individual nature of baseball, there are a wide range of possibilities for analysing player performance within a game-based setting.

Batting

One widely used measure is the Batting Average (BA), calculated by the equation BA=H/AB, where H is equal to the number of successful hits in play and AB is equal to the number of times at bat (Pankin, 1978). This is considered a very basic statistic, not accounting for the type of hit or the number of bases reached. It also discounts plays where the plate appearance produced a situation where a purposeful hit was avoided – for example, a sacrificial fly or being hit by the pitcher (Lindsey, 1963). Houser (2015) found that BA had a negative correlation with the number of wins, having a slightly negative effect on a team's overall score. Courneya and Chelladurai (1991) offered slightly different results. They concluded that BA was among the highest correlated statistics, equal to slugging percentage (SLG) and on-base percentage (OBP). They argued that these statistics are direct performance variables related to hitting balls, as opposed to statistics such as walks and stolen bases. While BA is considered by some to have weak negative correlations with player performance (Houser, 2015), other statistics are more strongly linked to the performance of players and the win rates of teams.

Otten and Barrett (2013) suggested that On-Base Percentage (OBP) and slugging percentage (SLG) more accurately estimated performance. SLG – (Total bases)/AB – is often associated with players who have the ability to hit the ball with power, resulting in obtaining extra bases on the hit. Otten and Barrett described SLG as representing batter effectiveness to produce hits which result in the runner being in a more advanced position than BA is able to represent. When considering the OBP (a measure of the player's ability to make it on base), modelled by the equation OBP=(Hits+Walks+HBP)/(AB+Walks+HBP), this statistic takes into account other avenues through which a batter can successfully placing themself in play, including walks and being hit by the pitch (Houser, 2015). In his study of baseball players conducted between 2000 and 2004, Houser (2015) concluded that OBP was the most statistically significant KPI equation when compared to BA and SLG. Because of the effectiveness of these two statistics, they are often formed into a single equation known as on-base plus slugging (OPS), which is the sum of both statistics combined. OPS is considered the most useful statistic for determining a player's offensive ability, as it not only considers all of the opportunities which the player has to reach the base, but it also factors in the base which the runner reaches in that play, creating a power component (Otten & Barrett, 2013; Demmink, 2010).

Stealing Bases

Often seen as a high-risk play, stealing bases may result in the runner being removed from a potential scoring position, with the reward being an increased opportunity to score on the next play. It describes the act of a baserunner attempting to run between bases when the ball is technically still in play, but when the pitcher is preoccupied with the hitter. Demmink (2010) concluded that the number of attempts at stealing a base in each game was correlated with a team's ability to win the game, although this was disputed by Otten and Barret (2013), who found that performance within both regular and postseasons had a higher correlation with win rates. Courneya and Chelladurai (1991) argued that stealing bases was a primary variable of a player's skillset, but a less significant KPI when compared to other statistics which were hit-focused.

Although the primary measurement of KPIs in baseball are the statistics discussed above, other methods of scoring or advancing are also considered here (Lindsey, 1963). Pankin (1978) studied games played between 1965 and 1975, comparing the effectiveness of different statistics at measuring performance. His KPIs were the offensive performance average (OPA; combined BA and OPS) and stolen bases per AB. His study also considered walks and stolen base attempts, while excluding tactics such as sacrifice bunts to provide a more tactical analysis of the system. He tested this system against another research-derived statistic proposed by Cover and Kielers (1977), which is considered more advanced and computed more advanced variables. Pankin's findings were, however, considered to offer a more holistic approach to the performance of a batter, should he consistently bat. Pankin (1978) found that both his proposed research-driven statistics had a higher correlation coefficient with the number of runs per game than the more mainstream statistics, with a difference of .001 between the coefficients of the research-driven statistics. He argued that the more holistic variable calculations led to more accurate assessments of performance within an applied game setting.

The use of statistics to support various areas of study within baseball presents opportunities for variables to be combined in different ways, and allows exploration of correlations within sets of data.

So-called 'clutch' hitters are also worth considering. The performance of a hitter who is able to excel in high-pressure situations (Hibbs, 2010) can be described in terms of a recurring set of proposed KPIs. While admitting that this scenario was inherently unlikely, Lindsey (1968) argued that clutch hitters could be classified as players with the ability to manipulate the type of hit delivered depending on the requirements of the team at a given point in the game. For Otten and Barrett (2013), clutch hitters are players who modify their performance to improve under high-pressure situations relative to their own regular or expected performances. In an attempt to quantify this phenomenon, Otten and Barret (2013) manipulated their collected data to show the difference in recorded metrics between regular and postseasons. They discovered that postseason win rates were directly correlated with the difference between the batting metrics from regular and postseason, indicating that under the higher pressures

of postseasons matches, the ability to improve batting performance is essential to producing runs. They indicated that this change may not be independent of a change in pitching success, as pitching metrics also increased between regular and postseasons, suggesting the need for further testing of this hypothesis to determine the contributions of both offence and defence.

With such a variety of statistics and statistical approaches to the sport of baseball, analysis of play can be conducted in depth. Through examining statistics-driven KPIs, the probability of a win or loss can be extrapolated and used to evaluate player performance. The literature supports several points of focus for assessing the effectiveness of KPIs. With the acknowledgement of clutch hitters, this area of research may highlight the changes in performance between regular and postseason games due to the high-pressure nature of the postseason. The aim of this study is to determine the likelihood of more aggressive attempts at taking bases in the postseason series due to the increased pressure experienced in these games (Otten & Barrett, 2011).

METHODS

Participants

The study was conducted using two MLB teams from the American League who participated in the American League Division Series (ALDS) during the 2017 postseason. The Boston Red Sox and Houston Astros participated in a 'best of five' series which was concluded after four matches.

Reliability

In order to test the reliability of the coding system and operator, an intra-reliability test was conducted on a randomly selected match of baseball. A percentage error calculation was used in order to determine reliability, resulting in a 0% error margin.

Key Performance Indicators

The KPIs used for this study were based on the aforementioned literature and chosen according to their relevance for offensive strategies and their perceived importance. The KPIs were broken down into four main areas, with further labels and descriptors applied. The areas were: method of out, base-reaching plays, sacrificial tactics and stolen-base attempts. The definitions of the KPIs used in the study are set out in Table 1.

Ethics

Institutional ethical approval was granted by Auckland University of Technology ethics committee prior to the start of the study

Descriptor	Definition
Out	
Tagged/thrown	A situation where the runner is either tagged by the ball held by an opposing player or out via force play
Caught	The ball is caught on the full, resulting in the batter being out
Strikes	When a batter gains 3 strikes
Base Reaching Plays	
Hit	Hit, when a batter successfully hits the ball and reaches at least first base
D	Double, when a batter successfully reaches second base on the same play after they make contact with the ball
T	Triple, when a batter successfully reaches third base on the same play after they make contact with the ball
HR	Home run, when a batter successfully reaches home plate in the same play after they make contact with the ball, resulting in a run scored
RBI	Run batted in, indicates a run scored as a result of the batter making contact, regardless of whether or not the runner makes first base
BB	Base on balls/walks, when a runner gains 5 balls and is awarded first base
Sacrifice Plays	
Sac Fly	When a player intentionally hits the ball upwards and gets out as to allow a runner to advance or score
Sac Bunt	When a player intentionally bunts the ball and gets out as to allow a runner to advance or score
Stolen Base Attempt	
Successful	When a runner successfully advances a base when not entitled to
Caught	When a player is caught attempting to stealing a base

Table 1. List of key performance indicators used in the present study.

EXPERIMENTAL DESIGN

In order to contrast the KPIs, a four-game series was chosen within the regular season, running from 28 September to 1 October 2017. The video footage was obtained from the MLB.TV media centre found on the MLB website (Major League Baseball, n.d.). Broadcasts varied between matches, with three of the regular season matches broadcast by New England Sports Network (NESN) and one broadcast by Fox Sports. Postseason matches viewed for the purpose of this study were all broadcast by Fox Sports.

Data Analysis

Once all data had been collected, the results of the coding were compiled into an Excel (Version 1705) spreadsheet. Averages over the games and series were calculated and used to compare the two series. Raw values were converted into 'per innings' values by dividing them by the number of innings the team played overall – some matches end prematurely as a result of the home team having a higher score in the middle of the ninth innings or, in the case of a tie in the bottom of the ninth, the teams continue until a team wins. (Thus, accounting for and eliminating the variation which may occur from these results was important.) Team KPI statistics were then calculated, with AVG, SLG, OBP and OPS being generated for both teams in both series, and for both teams combined in each series. The totals of the main KPIs were calculated, as well as the collected descriptors' data. From these descriptors, effect sizes and standard deviations were calculated in order to compare the results of the regular season and postseason series. Cohen's d effect size formula (1988) was used to determine the standardised mean as well as the collected descriptors' data. From these descriptors, effect sizes and standard deviations were calculated to compare the results of the regular season and postseason series. Cohen's d effect size formula (1994, 1988) was used to determine the standardised mean.

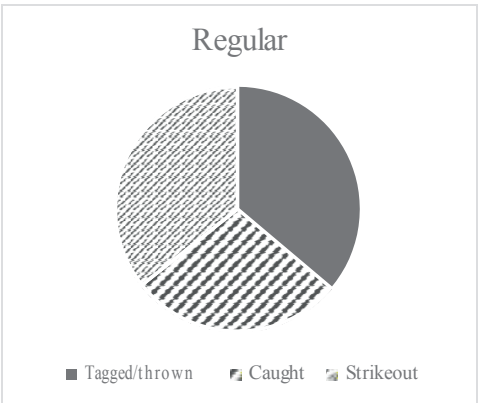
Results

Of the eight games in which KPIs were recorded, 140 innings were played. Of the four regular season games, three were played for a full 18 innings, with one being concluded in 17 – whereas only one game in the postseason was concluded in 18 innings, with three finishing in 17.

	Regular			Post		
	Tagged	Caught	Strikes	Tagged	Caught	Strikes
	1.00	1.00	1.00	0.56	1.33	1.11
	1.56	0.78	0.67	1.33	1.11	0.56
	1.00	1.38	0.63	1.33	0.78	0.89
	1.22	0.56	1.22	1.33	0.56	1.11
	0.67	1.11	1.22	1.44	0.67	0.89
	0.89	0.89	1.22	1.00	0.50	1.50
	1.56	0.78	0.67	0.78	1.00	1.22
	1.25	0.63	1.13	0.89	0.78	1.33
Mean	1.14	0.89	0.97	1.08	0.84	1.08
SD	0.31	0.27	0.27	0.32	0.29	0.30

Table 2. Counts of methods of out per innings in regular season compared to postseason

Statistical analysis of the effect size using Cohen's d formula (1994, 1988), conducted on the method of outs which occurred per innings, indicated a trivial effect size in the tagged and caught methods. Both tagged and caught out had effect size values of less than 0.2; however, strikeouts had a score of -0.379, considered to be a small change. However, none of the data was deemed to be statistically significant (P >0.05), and therefore no meaningful change was found between the regular and postseason series for the method of out.



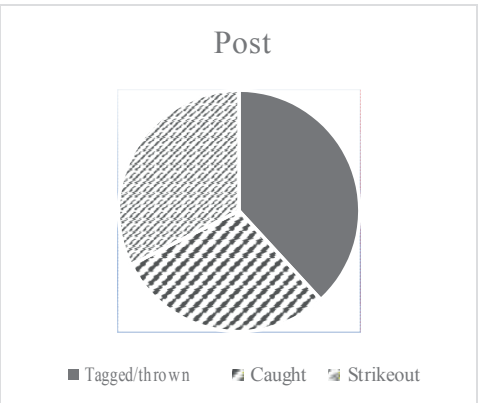


Figure 1. Breakdown of regular season methods of out per innings
Figure 2. Breakdown of post season methods of out per innings

Base-reaching Plays

With regards to BB, the effect size observed was trivial and was of no statistical significance (P>0.05). The number of hits increased between the regular and postseasons. The effect size measured using Cohen's d (1994, 1988) calculated to 0.84, making it large; however, it was not statistically significant and no meaningful change can be observed (P>0.05). As with the number of doubles observed, the effect size was small and is of no statistical significance (P>0.05).

	Regular	Post
BB	0.396	0.380
H	0.948	1.290
D	0.241	0.193
T	0.000	0.000
HR	0.099	0.194
RBI	0.469	0.599

Table 3. Mean instances per innings for base researching plays in regular and postseason games

No triples were coded over the 140 innings observed. The effect size for the home runs per nine innings was calculated to 0.65, warranting a moderate difference between the means. The difference generates a P = 0.06 and so was deemed to be not statistically significant. The analysis of the RBI rates revealed that there was also a moderate increase in the means between the regular and post seasons, although this was deemed to not be statistically significant (P>0.05).

When the correlation coefficient is considered for the hits with reference to the number of runs which occurred within the games, there was a very strong relationship between the number of hits made and the number of runs scored (correlation coefficient = 0.87). Individual correlation coefficients for the regular and postseason series were 0.99 and 0.77 respectively.

Sacrificial Plays

Only a single instance of a sacrificial play was observed within the eight games analysed. One sacrificial play occurred in the first game of the postseason series. Because there is only one point of data within this section, there was deemed to be insufficient evidence for a proper statistical analysis.

Stolen Base Attempts

During the course of the two series, there were six stolen base attempts, with four being successful and two unsuccessful. The greatest number of stolen base attempts occurred in the regular season, with four attempts taking place, three being successful. The postseason only contained two stolen base attempts, with one successful and one unsuccessful. While some data was recorded relating to stolen base attempts, there was not enough data to qualify for statistical analysis, as very high standard deviations indicate that the data was negligible.

Hitting Statistics

An analysis of the hitting statistics indicates a low spread within the data (Table 4). Effect statistics for the data show a large mean difference between all statistical formulas. There was a statistically significant change between the combined OPS for both teams in the regular and postseasons, with a standardised mean difference of 0.86 (P<0.05).

	OPS		SLG		OBP		AVG	
	Regular	Post	Regular	Post	Regular	Post	Regular	Post
Mean	.873	.677	.371	.508	.306	.365	.307	.238
SD	.234	.223	.145	.193	.082	.059	.061	.075

Table 4. Mean and standard deviations for offensive statistic, regular vs. post season.

A value larger than the effect size can be described as large. SLG and AVG also registered an effect size of 0.81 and -1.00 respectively, signifying a large change in the mean of statistical significance (P<0.05), albeit in different vertices. However, OBP had an effect size of 0.82, indicating a large mean difference (P>0.05); therefore, the effect is not statistically significant and indicates that this may not be a meaningful change. This indicates that, of the effects which can be described as statistically significant, the means for both SLG and OPS both increased from postseason to regular season, whereas the means for AVG decreased from regular to postseason. Correlation data for the four primary offensive statistics and the runs per innings were comparatively lower during the postseason, as shown in Table 4. The correlation coefficients for all measures were lower.

	AVG	SLG	OBP	OPS
Regular	0.959	0.974	0.929	0.971
Post	0.296	0.812	0.453	0.768

Table 5. Correlation Coefficient variables regular vs. post season

In summary, there is a significant relationship between hits made and runs scored. Mean OPS and SLG increased significantly from post to the regular season, while AVG decreased significantly from regular to postseason.

DISCUSSION

An analysis of the results from the first section (methods of outs) suggests very few differences between the regular and postseasons. There is some change in the distribution of outs between the caught and strikeout rates. It is important to note that frequencies of outs could not change, as the game demands that three outs mark the conclusion of an innings, so that the analysis of the frequency of individual balls or strikes could be an interesting subject for future research. Based on this preliminary study, a more in-depth analysis of the mechanics of the outs within baseball should be conducted. Further research into the underlying tendencies noted in the regular and postseasons should be undertaken to allow us to better understand the role which the distribution of outs plays in determining changes in external pressures and performance barriers which may affect this KPI.

While Table 2 shows the data for the base-reaching play KPIs, the size of the P values makes the data statistically insignificant. An analysis of the correlation coefficients reveals an observable difference between the coefficients for the regular and postseasons. In this context, the data suggests that the main mode of scoring in the postseason is not simply through gaining hits – instead, there is a greater emphasis on a player being able to remain on base and pick specific times to advance. The opposite is seen in the regular season, where the ability to simply make it on base will most likely lead to a subsequent run. When compared to the aforementioned batting statistics, the SLG also had a higher correlation with run rates than AVG in the postseason, suggesting that the ability to gain extra base hits and advance past first base is an important skill for the postseason, in contrast to a player's ability to simply make first base in the regular season.

The data shown within the results section indicates that there is a statistically significant increase involving noticeable change in the means for the offensive statistics of SLG and OPS. Increased aggressiveness in the offensive play of

a team in the postseason (as opposed to the regular season) is possible. As described in the literature, SLG and OPS are the primary statistics which describe aggressiveness in the batter's initial baserunning (Houser, 2015). This increase in the level of aggressiveness might reflect the emergence of clutch hitters within the team. As Hibbs (2010) argues, the highly demanding atmosphere of postseason matches may account for the increase in these statistics, and make batters more aggressive in their baserunning in order to place themselves in a more advantageous position for the next offensive play.

In their statistical analysis of postseason win projections and regular season batting metrics, Otten and Barrett (2013) discuss the high correlation between win rates in the postseason and batting statistics within the regular season. When compared with the results of the present study, there is an attributable difference between the regular and postseasons, and this increase in mean statistics of batting effectiveness supports the claim by Otten and Barrett (2013) that the pressures of the postseason can affect players' performance. In the present study, the results show that players become less able to make contact with the ball, having a decreased AVG, yet the number of extra bases acquired following a successful hit increases during the postseason.

Another difference in the hitting statistics between the regular and postseasons is the change in correlation coefficients of run rates and hitting statistics. Althought there was a noticeable drop in the effectiveness of the AVG statistic in predicting run rates in the postseason, according to Houser (2015) AVG is an inefficient statistic for determining win percentages. Nevertheless, such a notable change signals the possibility that only the more efficient power hitters are able to advance past first base. While SLG increased from regular to postseason, the decrease in AVG may be attributed to the higher number of home runs within the postseason (0.099 per innings in the regular season vs 0.194 in the postseason), as the number of home runs acquired is equal to four hits in the SLG equation.

Returning to the question of pressure within the postseason matches and the phenomenon of clutch hitters, when considering Otten and Barrett's (2011) explanation for clutch hitters and how they emerge in situations where performance above the normal is required, the ability to produce home runs, an instantly scoring play, may be considered one of the most important KPIs to consider when selecting players for a playoff team.

Very few stolen base attempts were made in the postseason, possibly due to the tactical demands of the game and the relative importance of keeping players on base for the postseason. Demmink (2010) has studied the importance of stealing bases and discusses his findings on the increase in win rates as the number of stolen bases increases. Stealing bases also brings an element of risk, as he found that a quarter of players were caught stealing bases. While the successful steal of a base – from first base, for example – would place the runner in a scoring position, there is still a probability of the runner being caught and forfeiting an out and space on a base in that innings (Lindsey, 1963). The relative importance of this move should not be overlooked, however, as in the high-pressure environment of the postseason, pitchers are also under immense pressure to win the game and, as Demmink (2010) found, a pitcher's subsequent performance is adversely affected when a player steals a base. Although only a very small amount of data was analysed with regards to the stealing of bases within a game-based setting, its possible importance should be recognised.

Application to Coaching

The findings of this study may help coaches choose which players to use for the regular and postseasons. The substantial increase in the SLG statistic in the postseason may warrant the use of more power hitters in high-pressure series. Compared to the regular season, where gaining a base hit was of fundamental importance, in the postseason the ability to simply make successful contact and score runs showed a higher correlation, suggesting that players with the highest consistency of contact are preferred.

Limitations

While this paper could serve as a preliminary pilot study, it has some limitations which impact on its findings. One limitation is the relatively small study size. As only eight games were analysed, some variables had very little instances and so were deemed unimportant for the purpose of analysis. With a much larger sample, size trends within smaller variables may become easier to observe and present new areas of analysis. As variability may be present between the play styles of the teams in the MLB, future studies should develop the coding system used here and further test the way in which the variables differ from one another. In addition, only the preliminary round of the postseason was analysed. In order to get a true indication of the effect of the pressures of competing in both regular and postseasons, the effect of the postseason series on subsequent performance should be considered.

With the inclusion of so many variables, the quality of the analysis can be questioned. Because of the variety of outcomes and instances which were coded for, there was a lack of in-depth analysis. Thus some findings were discarded due to a lack of possibly relevant data, which may have had an influence on other statistical breakdowns. These factors indicate the need for future research, where the type and velocities of pitches are analysed and tested against the performance pressures which are present within postseason matches, as opposed to the regular season.

Future Research

Future research might well pursue further analysis of clutch hitters within baseball. As the present study involved a whole-team analysis, using Otten and Barrett (2011) to substantiate its claims, an analysis of individuals and their performance under specific constraints may reveal more about the phenomenon of clutch hitters. While not a new field of research, statistical uncertainties remain about clutch hitters, and the mechanisms responsible for the differences in performance, due to pressures in both regular and postseason matches, should be considered in greater detail.

As mentioned, our study lacked depth in some aspects of its analysis. The field of sports analysis as it applies to baseball would benefit from a coding system designed to further break down the areas considered above. One potential area might be the study of pitch type, speed and location (compared with outcome) in order to build on the groundwork established in this study through the breakdown of methods of outs. Further research into different patterns of baserunning under pressure would also be useful, including analysis of the decision-making process involved. Following this theme, more work on the strategies involved in stealing bases in postseason matches might reveal the role of pressure in the decision-making process and reveal the risk–reward relationship inherent in attempting a base steal.

CONCLUSION

We found some instances within the game of baseball where there are differences in aggression levels of offensive plays in a regular season match compared to a postseason match. Through the statistical analysis, we can pinpoint the areas where performance both increases and decreases as pressure is added in the postseason game. A major finding of the study was the increase in the main power statistic, SLG. Where the AVG decreased, the SLG rose, indicating increased levels of aggression when taking extra-base hits and where players were looking for opportunities to place themselves in a scoring position. The most prominent finding, however, was evidence that postseason run rates had a higher correlation with a player's ability to make an extra-base hit – for example, a double, as opposed to simply making first base. Our research question – to determine the existence of a change in the offensive tendencies of baseball players in the postseason compared with the regular season – has been answered. Our data indicated that there was an attributable change in statistical measures relating to batting between regular and postseason matches.

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