

A Statistical Analysis of Baseball's Backwards 'K'

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– March 2009

Introduction

My name is Ezekiel Silverstein. I am in 10th grade at Weston High School in Weston, Massachusetts. I love baseball, and I am a very strong math student. My dad and I often have theoretical and provoking conversations about sports. After one particularly interesting discussion, we decided to conduct a study in order to test our proposition: The frequency of a baseball player striking out 'looking' is a function of where, and whether, the player plays in the field defensively.

Hypothesis

The hypothesis of this paper is that major league catchers strikeout looking less frequently than other position players because catchers have a better command of the strike zone. This hypothesis is based on the fact that catchers are the closest position player to home plate and have the best view of the strike zone. As a result of this unique vantage point for nine innings, 27 outs and 100+ pitches catchers gain a better sense of the home plate umpire's strike zone. Catchers can translate this knowledge to their own at-bats by swinging at fewer bad pitches and by not watching as strike three whizzes past them with their bat resting on their shoulder. By extension, our hypothesis is that after catchers middle infielders strikeout looking less frequently than other position players because of their enhanced view of the strike zone given where the shortstop and second baseman are positioned in the infield. It is unclear whether the closeness of the corner infielders to home plate is more of an advantage than the center fielder's head-on view of the strike zone. It is possible that the center fielder's distance from home plate is more of a disadvantage than the poor angle that the first and third basemen have of the strike zone. Our hypothesis also presumes that the corner outfielders, of all position players, strikeout looking most often because of the combination of their angled view of the strike zone and their distance from home plate. Lastly, designated hitters and pinch hitters should strikeout looking more frequently than all position players because the only pitches they have a good view of and on which they can judge the strike zone are the pitches they face during their own at-bats. Given this, designated hitters should strikeout looking less frequently than pinch hitters because designated hitters bat several times a game while pinch hitters may only bat one time per game. Pitchers are not included in this study. American League pitchers do not bat at all. National League pitchers, while they do bat, are far more focused on and concerned with their pitching than they are with their hitting. These pitchers do not work as hard on their hitting as do position players and, as a result, they tend to strikeout both looking and swinging much more frequently.

Methodology

In order to prove the hypothesis, we needed to gather information on individual players by position regarding their propensity to strikeout looking. We needed a large enough sample size for the information to be meaningful and statistically significant. We also wanted to test the hypothesis over more than just one year to refute the argument that our results were just a one-year aberration. To our surprise, information regarding strikeouts looking was much harder to find than we had thought it would be. It took considerable online research, emails and phone calls before we could locate this information. Finally, we were able to get the essential information from Pennsylvania-based Baseball Info Solutions (www.baseballinfosolutions.com). We were able to get information regarding strikeouts looking for every major league baseball player, by position, for the 2005 and 2006 seasons. Other relevant statistics that we used were: Total Plate Appearances (TPA); Intentional Walks (IBB); and Hit-By-Pitches (HBP). These and certain other statistics were obtained from Major League Baseball (at its website www.mlb.com) and from ESPN (at its website www.espn.com). In order to calculate the accurate percentage of strikeouts looking, we had to include every at-bat in which the strike zone was relevant, and exclude every at-bat in which the strike zone was not relevant. Therefore, for this study, we subtracted IBB and HBP from TPA because, when a batter is either hit by a pitch or intentionally walked, his command of the strike zone isn't challenged. We defined this number as TPAa (Adjusted Total Plate Appearances). We then divided the number of strikeouts looking for each player by the TPAa for that player to get the player's strikeout looking percentage ('KLP'). These calculations were

performed for every position player, designated hitter, and pinch hitter for each of the 2005 season and the 2006 season, and again for the 2005 and 2006 seasons combined. These calculations were then performed again for each position also for each of the 2005 season and the 2006 season, and for the 2005 and 2006 seasons combined. If a player played more than one position, we assigned that player the position he most frequently played. If a player was listed as a pinch hitter or had fewer than 100 at-bats in a season, he was categorized as a pinch hitter. Through this exercise, we were able to obtain the KLP for each player and each position, and we were able to compare the KLP by individual player, by position and by year. Of course, our focus for this project was on the KLP by position.

Results

For the combined 2005 and 2006 seasons, middle infielders had the lowest KLP, with shortstops at 3.36% and second basemen at 3.68%. Following the middle infielders, catchers had the next lowest KLP at 3.79%. These three positions fared far better than all of the other position players. After the middle infielders and catchers came the corner infielders and outfielders, all five positions lumped very close together. First basemen had a KLP of 4.37%, followed by center fielders with a KLP of 4.40%, followed by third basemen at 4.45%, followed by right fielders at 4.52%, and lastly left fielders at 4.54%. The highest KLP by far belonged to the designated hitters and pinch hitters, with designated hitters having a KLP of 5.23% and pinch hitters having a KLP of 5.47%.

The precise results by position for each of the 2005 and 2006 seasons, and for the 2005 and 2006 seasons combined are as follows:

2005 2006 Combined

Shortstop (3.31%) Second Base (3.37%) Shortstop (3.36%)

Second Base (3.80%) Shortstop (3.40%) Second Base (3.68%)

Catcher (3.99%) Catcher (3.78%) Catcher (3.79%)

Center Field (4.19%) Right Field (4.18%) First Base (4.37%)

Third Base (4.46%) First Base (4.25%) Center Field (4.40%)

First Base (4.50%) Third Base (4.43%) Third Base (4.45%)

Left Field (4.61%) Left Field (4.47%) Right Field (4.52%)

Right Field (4.84%) Center Field (4.60%) Left Field (4.54%)

Designated Hitter (4.95%) Designated Hitter (5.50%) Designated Hitter (5.23%)

Pinch Hitter (5.38%) Pinch Hitter (5.57%) Pinch Hitter (5.47%)

Analysis

While the specific premise that catchers have the lowest KLP was not supported by the results, the overall results do seem to support the general proposition of our hypothesis. Catchers, the results show, do have one of the lowest KLPs among all position players. Interestingly, except for the fact that catchers placed third behind shortstops and second basemen in terms of KLP, all of the other results were amazingly consistent with our hypothesis. Aside from the flip-flopping of catchers and middle infielders in the final results as compared to the hypothesis, everything else matched up nearly precisely as we had anticipated they would: first basemen were next, followed by center fielders, followed by third basemen, followed by corner outfielders, followed by designated hitters, followed by pinch hitters.

In further analyzing the results, we asked ourselves what factors may have contributed to middle infielders having a better KLP than catchers. Although it was not what we had hypothesized, it is not surprising that middle infielders have the best KLP. Certainly, their enhanced view of home plate and the strike zone is a very favorable factor. In addition, middle infielders tend to be contact hitters — striving to make contact with the ball by hitting it in play hoping to reach base, being perfectly content with a single. Catchers, on the other hand, typically are not viewed as contact hitters but, rather, as power hitters instead — striving to hit the ball long and far for a homerun or an extra base hit. Contact hitters tend to be very adroit at the plate and with the bat and tend to respond better to different and unexpected pitches. In other words, middle infielders, as contact hitters, are less likely (compared to power hitters) to be fooled by pitch selection and caught off guard or ‘frozen’ at the plate. This certainly is another factor that could explain why middle infielders have a slightly better KLP than catchers.

This same point can also be used to further support our hypothesis. Many baseball observers would agree that outfielders (and, perhaps, third basemen as well) tend to be defter at the plate than catchers. Despite this, though, catchers still had a superior KLP than all outfielders (and corner infielders as well). Therefore, the catcher’s proximity to home plate and the strike zone, arguably, does make a meaningful difference and cause catchers to have a better KLP than others (except for middle infielders), despite not being known for their deftness.

It is noteworthy, and further supportive of our hypothesis, that first basemen have a lower KLP than third basemen. Most major league batters are right handed and hit from the left side of home plate. This results in first basemen, more frequently than third basemen, having a clear and unobstructed view of home plate and the strike zone and, therefore, striking out looking less frequently. Further supporting our hypothesis is that the same results occur between right fielders and left fielders. Right fielders, compared to left fielders, have a clearer and less obstructed view of home plate and the strike zone and, therefore, strikeout looking less frequently.

One of our questions early on was whether the center fielder had an advantage over the corner infielders because of his head-on view of the strike zone, or whether the corner infielders had the advantage over the center fielder because of their closeness to home plate. First basemen, as it turns out, have a lower KLP than center fielders, suggesting that being closer to the strike zone is more important than having a clearer view of the strike zone. However, third basemen, our results reveal, have a higher KLP than center fielders. How can this seeming inconsistency be explained? Well, quite easily actually. Because, as discussed above, so many more hitters are right handed and bat from the left side of home plate, a first basemen generally has a clear and less obstructed view of the strike zone. This superior vantage

point and the first baseman's closeness to home plate are factors that, arguably, explain why first basemen have a better KLP than center fielders. However, it appears that the advantage of the third baseman's closeness to home plate, compared to the disadvantage of the center fielder's distance from home plate, is not enough to overcome the disadvantage of the third baseman's frequent obstructed view of the strike zone given the plethora of right handed batters compared to the advantage of the center fielder's head-on view of the strike zone. This, arguably, explains why center fielders have a lower KLP compared to third basemen, even though they have a higher KLP compared to first basemen. Not surprisingly, center fielders have a lower KLP than corner outfielders, again suggesting that the angle to home plate and the degree to which one's view of the strike zone is obstructed are indeed factors that explain the differing KLPs among outfielders. Concluding this reasoning, as mentioned above, left fielders strikeout looking the most of all position players because of the combination of their distance from home plate and their obstructed view of the strike zone given the large number of batters hitting from the right side of home plate.

As expected, designated hitters and pinch hitters strikeout looking the most due to the fact that the only pitches they see are during their individual at-bats and, as a result, they have fewer opportunities to develop a command of the strike zone and, therefore, they do so much more slowly. Pinch hitters strikeout looking more often than designated hitters because designated hitters have multiple at-bats in a game and can better judge the strike zone in their latter at-bats while pinch hitters usually only have the one at-bat to assess the strike zone.

Despite being pleased that the results of this study generally supported our hypothesis, we nonetheless asked ourselves if there were other factors beyond just a player's proximity to home plate and his view of the strike zone that also could explain or impact these results and, perhaps, explain why the KLP for catchers was as low as it was, but still not as low as the KLP for middle infielders. The following are a few ideas:

- Middle infielders and catchers may be smarter than other position players and, somehow, can better and more quickly assess the strike zone and apply this information to their own at-bats;
- Middle infielders may be smaller than catchers and, therefore, may have smaller strike zones, thereby making it harder for pitchers to throw strikes to these players;
- Because catchers have a better rapport with umpires, and physically protect umpires, the umpires may be less inclined to call out catchers on borderline pitches.

Of course there are so many other factors that are beyond the scope of this paper that also could have an impact on the results of this study. Among these other factors are the following:

- The number of times the batter has faced the pitcher;
- The count on the batter when he strikes out looking;
- The type of pitch thrown immediately prior to the pitch on which the batter struck out looking;
- The number and type of pitches thrown during the entire at-bat;
- The order of the different types of pitches thrown during the at-bat;
- The batter's eyesight;

Conclusion

The results, in general, were expected and unsurprising. Using the data we obtained from Baseball Info Solutions, we were able to calculate how often major league baseball players struck out looking in the 2005 and 2006 seasons. With this information, we were able to calculate the strikeout looking percentage for each position and to compare the results. We learned that these comparisons both negated and supported our hypothesis. The evidence shows that middle infielders strikeout looking the least, thereby negating our hypothesis that catchers strikeout looking the least. However, with catchers following close behind, this supported our hypothesis that a player's command of the strike zone can be improved based on his defensive position due to his proximity to home plate and his view of the strike zone. In the middle of the pack are the rest of the position players and trailing well behind are designated hitters and pinch hitters. This, too, supports our hypothesis that players can have a better or worse gauge of the strike zone depending on his proximity to home plate and his view of the strike zone.

Appendix

Attached to this report is an Appendix containing the statistical information we used to perform the calculations and arrive at the results discussed in this paper.

About the authors:

Ezekiel Silverstein is 16 years old and is in the 10th grade at Weston High School in Weston, Massachusetts. 'Zeke' enjoys playing and watching most sports. He plays baseball (first base and catcher) and basketball (guard) competitively, and he is a member of his school's squash club. When Ezekiel was younger, he was a competitive and nationally ranked chess player. Zeke learned math by studying the box scores and team standings in the sports pages of The Boston Globe. In school, Ezekiel's favorite subjects are math and science, and he is especially interested in astronomy. Zeke's

love for baseball and his aptitude for math prompted this project. Ezekiel is the son of Ross Silverstein, and he lives with his parents, his three younger sisters, and his dog, Homer. Ezekiel can be reached by email at ezmasilv@umich.edu.

Ross Silverstein, the father of Ezekiel Silverstein, lives with his wife and four children in Weston, Massachusetts. He loves watching and playing sports, and he regularly coaches his kids' town sports teams in baseball, softball and basketball. Growing up, Silverstein played baseball, basketball, football, hockey and tennis. Among the many great sporting events Silverstein attended was the sixth game of the 1975 World Series between the Boston Red Sox and the Cincinnati Reds (the 'Big Red Machine') in which Carlton Fisk hit the game winning homerun in the bottom of the twelfth inning to force a decisive game seven. Silverstein is a graduate of Boston College, the Sloan School of Management at MIT, and Boston University School of Law. Presently, Silverstein is the Founder, President and CEO of iPROMOTEu, a company based in Wayland, Massachusetts that operates within the promotional products industry. Mr. Silverstein can be reached by email at rsilverstein@alum.mit.edu.