

The Effects of Pressure on a Pitcher in Baseball

Introduction: We have all witnessed it. The starting pitcher is dealing throughout the game, into the 7th inning with a decent pitch count and two outs but a one-run game. Then he gives up a double and, as if the manager knew before the at-bat that a double was coming, he is out and changing pitchers to his reliever. Many of these decisions may make you yell “WHY?!” at your TV and groan when the reliever then gives up another double, and a single, and a walk, and then a grand slam... or the reliever rolls a routine groundball to the second-baseman, the manager is praised, and the game continues. Many of these decisions are based on statistics such as OPS, BA, WHIP, etc. and the handedness of both pitcher and batter. However, is there a statistic that can examine a situation within a game and provide the best pitcher options for a manager based on the pressure in that situation? This question and its implications are the reason I decided to do a case study in the 2020 MLB season to examine situations and the OBPs Against of the pitchers in those situations. I used the data from each pitch in the 2020 MLB season, including the balls, strikes, men on base, number of outs, and inning in my project.

Motivation: The motivation for my project comes from my own experience as a pitcher for 10 years and my interest in pitcher analytics and performance. The anecdote that I mentioned before is a common case, so is it possible to ensure that you put your team in the best situation by putting high-pressure pitchers in high-pressure situations and low-pressure pitchers in low-pressure situations? My big question: Is there a statistic that can examine a situation within a game and its factors, such as inning, number of outs, men on, count, score, and other factors and provide the best pitcher options for a manager based on the pressure in that situation and how a pitcher has performed under pressure in the past? I think this is a key issue because

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ensuring that you have the best chance in key situations can make or break a game, a career, and even a season.

Methods/Findings: To begin, I retrieved my data, every pitch from the 2020 MLB season, using BaseballR. I decided I wanted to evaluate a few things:

1. What is the average pressure score of each pitcher?
2. What is each pitcher's overall OBP Against?
3. How does pressure score influence a pitcher's OBP Against?

Many factors influence the pressure of each pitch in baseball. Here are the ones that I thought of:

- Inning
- Score
- Count
- Number of Outs
- Men on Base
- Pitcher/Batter Handedness

Some of these, such as score, were not present in the data I received from BaseballR, but I used the data that I did have to try to create an accurate pressure score. Obviously, these scores are not a perfect science and many other factors can be considered. I am hoping that if this project is approved and I get this internship, I can continue working on this project and refining it with other members of the baseball statistics team. This is an introductory look into the idea of quantifying situations in baseball such as the count in an at-bat. For each factor that was in the data, I broke them down into sections and assigned points to each section to determine the pressure in that moment. The breakdown is below.

Inning	Pressure Points
1-3	1
4-6	2
7-9	3
9+	4

Outs	Pressure Points
0	1
1	2
2	3

Runners On	Pressure Points
None	1
First	2
Second	3
Third	4
First + Second	5
First + Third	6
Second + Third	7
Bases Loaded	8

Count	Pressure Points
0-0	3
0-1	2
0-2	1
1-0	4
1-1	3
1-2	2
2-0	5
2-1	4
2-2	3
3-0	6
3-1	5
3-2	7

By using these points, I created pressure scores for each pitch to determine (on an elementary level) the pressure level of each pitch each pitcher threw. To determine how a pitcher does in these situations, I calculated the overall OBP Against of each pitcher, the OBP Against in situations where the Pressure Score was less than or equal to 7, and the OBP Against in situations where the Pressure Score was greater than 7. This data allows us to look at how some pitchers might be better than others in situations in which the Pressure Score was greater than 7, or how one pitcher might perform very differently in one situation compared to another. I also calculated an Average Pressure Score for each pitcher, to look at how certain pitchers are utilized. If a pitcher's Average Pressure Score is over 10, they are most likely used more often in late-inning, higher pressure situations so their OBP may be higher. If a pitcher's

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Average Pressure Score is closer to 6, 7, or 8, they might be a starter, or a pitcher that is brought in in less pressing situations. However, the limited sample size of relievers compared to starters and the nature of relievers coming in during higher pressure situations more often can skew data, so it is tough to compare relievers to starters, other than by comparing how they do in each Pressure Score situation. For example, a starting pitcher should be expected to have a low OBP Against in low-pressure situations whereas a closer or setup man should excel in high-pressure situations. The data can be interpreted in many different ways but is best utilized in comparing pitchers who often appear in similar roles to determine which pitcher might be better suited for each situation.

Conclusion: In creating this project, I have realized that this is a far deeper concept than a month long project can cover. So many different factors and situations can be analyzed to develop Pressure Scores and to develop ideal comparisons for different pitchers. With that being said, I believe UNC Baseball would benefit from this because I think that this project is a great start towards developing a stronger method in choosing which pitcher to choose in each scenario that a manager may face, and as a practice method to push pitchers to work on certain situations they struggle in. I am excited to potentially have the chance to join the UNC Baseball Analytics and either continue my efforts with this project or work on something else. I have truly enjoyed learning R and how to use R in baseball statistics, as sports statistics is a passion for me. Thank you!