In this project, we were asked to analyze pitcher roles in baseball.

Given the rule changes in baseball, the game has become increasingly fluid and amorphous in nature, leading way to the possibility of new pitcher roles that go beyond the traditional starter, relief, and swingman roles.

In this analysis, we do not propose new or additional pitcher roles that would address the fluid nature of the game. Rather, we analyze current pitcher roles to better understand why a pitcher might be considered a particular type or role over the other – say, a starter over a reliever. In other words, is a pitcher being correctly classified as a starter, reliever, or swingman? And if not, why is this the case?

To answer this question, we started with Fangraphs’ season level dataset which provided pitchers’ data over three seasons (2021-23). We wanted to evaluate pitchers on their pure pitching ability and not on their ability to garner outs with the help of teammates. Therefore, statistics such as “Earned Runs Average” were not considered in this first step of the analysis. Instead, we looked at only how many strikeouts a pitcher recorded per inning pitched (also known as “SO/IP”).

Using this statistic (SO/IP), we ranked pitchers based on their pure pitching ability, and we found several relievers to possess greater pitching ability than their starting counterparts. This list comprised of 171 total non-starters such as Aroldis Chapman, Edwin Diaz, and Josh Hader – all of whom are relievers with 120 games played and 100 innings pitched over multiple seasons, and whose SO/IP is greater than or equal to 1.6. In fact, they are the only three players who had more than 1.6 strikeouts per inning pitched.

A graph of a number of red and blue bars

Description automatically generated

Relief pitchers collectively scored a higher SO/IP compared to starting and swingman pitchers. Significance testing was not conducted as the statistic shown here to compare the three pitcher groups is not the average of each player’s SO/IP but rather an aggregate measure. The aggregate SO/IP for each pitcher group is roughly equal to 1. Starting pitchers have the lowest strikeouts per inning pitched (SO/IP) as shown in the plot above. We hypothesize this may be due to three reasons, which are listed below.

1. Starting pitchers play more innings in a single game compared to relievers, indicating greater workload and risk of fatigue.
2. Starting pitchers play more tight-game situations, indicating greater pressure and risk of error.
3. Starting pitchers play against higher caliber batters more often.

A graph of a game

Description automatically generated with medium confidence

The Fangraphs’ season level dataset contains data on 258 relief pitchers, 257 starting pitchers, and 29 swingman pitchers. The 258 relief pitchers combined threw 1.02 innings per game, compared to the starting pitchers group which threw 5.38 innings per game. This indicates clearly that starting pitchers take on a greater workload during games and are at higher risk of injury or physical fatigue, which in turn, may be contributing to the starting pitcher group’s low SO/IP.

Baseball Savant’s pitch level dataset was used to answer the remaining two hypotheses regarding the difference in pure pitching ability between relief and starting pitchers. Pitch level data does not provide precise estimates of innings pitched, and therefore we use number of events in place of innings pitched to understand in-game workloads. We define tight-game situations as moments in the game where the home team was either leading or losing to the away team by a margin of two runs.

From the 2021 to 2023 season, there were 7,128 regular season games where the score was within two runs at some point during the game. We calculated the difference in number of events between starting and relief pitchers for each of these games. The highest differential in the number of events between starting and relief pitchers was 103; the lowest differential was -25.5, meaning relievers averaged 25.5 more events than starters in that particular game. Across all 7,128 regular season games, the average differential was 54.35 events. Overall, pitchers average 36.21 events per game. This clearly indicates that starting pitchers play more tight-game situations where the score is close (within two runs). Due to playing more tight-game situations, starters likely experience greater physical fatigue and mental pressure than relievers, and therefore have a lower SO/IP.

A graph with a line drawn on it

Description automatically generated

Lastly, starters likely have a lower SO/IP than relievers due to pitching against stronger hitters more often. We measure hitting ability based on a batter’s weighted on base average, or wOBA.