Analyzing Lucas Giolito's 2025 In-Season Turnaround

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Introduction

During the offseason before the 2024 season, Boston Red Sox Chief Baseball Officer Craig Breslow signed right-handed starting pitcher Lucas Giolito to a two-year, $38.5 million contract, with a player option for the second season (Burrows). Unfortunately for both parties, Giolito would suffer a season-ending elbow injury during Spring Training of 2024. Additionally, he would suffer a hamstring strain that kept him out for the start of the 2025 season (Burrows). On April 30, 2025, Giolito would make his Red Sox debut against the Toronto Blue Jays. Over his first seven starts on the team, Giolito pitched to a 6.42 ERA (earned run average) despite having a few strong outings (McAdam). After a tough start at home against the Angels, Giolito and Red Sox pitching coach Andrew Bailey made some adjustments to his pitching mechanics in order to be more competitive (Henrique). In the following six starts, Giolito was stellar, posting 0.88 WHIP (walks and hits per inning pitched) and 0.70 ERA (McAdam). This analytical report uses Statcast data, Microsoft Excel, and the programming language R to highlight Giolito's mechanical adjustments and changes in performance in the six starts following the game against the Angels in June. The data, R code, and output can be found on GitHub (linked above) in the repository titled 'lucas-giolito-analysis-2025'.

Methodology

Data Acquisition and Excel Calculations

Two different online sources were used to find Lucas Giolito's mechanical and performance data relating to his first thirteen starts in a Boston Red Sox uniform. Baseball Savant's Statcast Search feature was used to track mechanical data such as arm angle, horizontal release point, vertical release point, and extension for each of the thirteen starts. It is important to note that these are pitch metric averages, meaning the calculated values from Baseball Savant are the average of all measurements in a given start. For example, on May 24th, against the Baltimore Orioles, Giolito maintained an average arm angle of 48.0° across the 99 pitches that he threw in that game. The data points for extension, measured in feet, represent how far off the mound a pitcher releases the ball ("Statcast Search"). Generally speaking, having high extension is important because it gives hitters less time to react, thus increasing perceived velocity. From the CSV Documentation feature, the vertical release point, measured in feet, is how high the ball is released from the catcher's perspective ("Statcast Search"). The horizontal release point, also measured in feet, is the horizontal distance from the catcher that the ball is released from. Because Giolito is a right-handed pitcher, his horizontal release point measurements are negative. This finalized pitching mechanics data set can be found in the 'data' folder on GitHub with the title 'Lucas Giolito Arm Angle and Mound Data.csv'.

Performance data was pulled from PitcherList.com using the Game Log feature for Lucas Giolito. The basic pitching data, which includes pitch count, strikes, balls, total batters faced, hits, walks, and strikeouts were pulled from the Standard tab. Strike percentage, strikeout percentage, walk percentage, and hits percentage were then calculated in Microsoft Excel. Pitch mix data was collected from the Pitch Mix tab on this same page. Giolito throws four pitches: a four-seam fastball, slider, changeup, and curveball. The total number of each pitch was tracked for each pitch type, and the percentages of each pitch type were calculated for each start and for the entire season. This pitching selection and performance data set can be found in the 'data' folder on GitHub with the title 'Lucas Giolito Pitch Mix and Outcomes.csv'.

R Programming

Three R scripts were used for this project, and they can be found under the 'scripts' folder in the GitHub repository. The first script was created in order to track Giolito's pitching mechanics both before and after the work done with pitching coach Andrew Bailey. According to Giolito, the major fix by Bailey was helping him fix his arm angle during this meeting in June (Burrows). In R, a new column called 'Angle' was created to separate the season into two halves: one before the arm angle switch (first seven starts) and one after the switch (last six starts). These are appropriately named 'First Half' and 'Second Half'. Using the 'ggplot2' package, Giolito's average arm angle per start is displayed with colored lines for these aforementioned halves. As a baseball fan and former pitcher, it is understood that changing one pitching mechanic, such as arm angle, can also change other pitching mechanics. With this in mind, a facet plot was created to illustrate how arm angle, extension, horizontal release point, and vertical release point all change by start number. To graph this on one visual, the data had to be reshaped to R's long format. The full R script is titled 'pitch_mechanics.r'.

The second R script, called 'pitch_mix.r', looks at Giolito's pitch selection throughout his first thirteen starts. The 'ggplot2' package is used again to graph Giolito's strike percentage by start to see if the mechanical changes are helping him pound the strike zone. A horizontal dashed line at 61% is an estimate of a league average strike rate. The true league average strike percentage is always changing, but 61% felt like a decent estimate. The second plot in this script shows the usage percentage of each of the four pitches that Giolito throws. Giolito himself said that he needed to be using his four-seam fastball more, especially against right-handed hitters (Henrique). The goal was to put all four pitch (fastball, slider, changeup, curveball) percentage lines on one plot, so the data needed to be reshaped to long format again. Additionally, using the 'tidyr' package, mutations were made for the labels on the legend because R reads the '%' sign from Excel as a '.' instead. This can be seen on lines 30 through 34 within this script. On this plot, a vertical black line was created between Giolito's 7th and 8th starts in order to show where the significant mechanical changes were made.

The third script, titled 'outcomes.r', is the shortest of the three scripts. In a similar way that the pitch mix plot was created, the goal was to graph hit percentage, walk percentage, and strikeout percentage all on the same plot using the 'ggplot2' package. The same vertical black line was used to differentiate Giolito's two halves of the season thus far. Once again, the labels needed to be mutated for the legend.

Results and Discussion

Average Arm Angle

Figure 1 below shows Lucas Giolito's average arm angle by start, with the blue line representing starts before mechanical changes and the orange line representing starts after. As seen below, Giolito started off the season with an average arm angle ranging anywhere from around 48° to 51°. As mentioned before, this arm angle did not yield the results that the Red Sox and Giolito were hoping to achieve. It is clear from Figure 1 that Andrew Bailey and Lucas Giolito worked on arm angle during their meeting, as his average arm angle increased in his most recent six starts. His average arm angle in his first start after the meeting was above 51°, and he has not had an average arm angle below 50° since the meeting with Bailey. Additionally, it is evident his average arm angle has been gradually increasing by start, with his most recent average arm angle being measured at almost 55°. From a mathematical standpoint, a 90° arm angle means the pitcher is releasing the ball with his arm straight up vertically, while a 0° arm angle means the pitcher is releasing the ball directly from the side. Therefore, these changes in average arm angle essentially mean that Lucas Giolito is now getting on top of the ball a little bit more during his throwing motion.
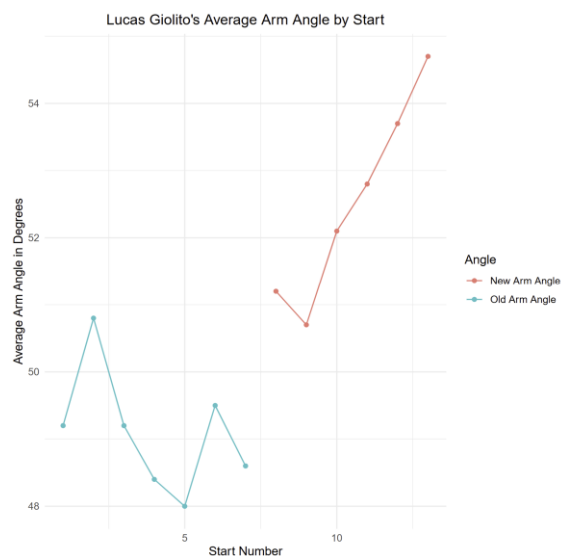

Figure 1: Plot showing Lucas Giolito's average arm angle by start. This was made using the 'ggplot2' package in R.

Subsequent Mechanical Changes

 Figure 2 below shows Lucas Giolito's average extension, horizontal release point, and vertical release point by start this season. The orange and blue lines carry the same meaning as they did from the previous graph. It is clear that Giolito's arm angle is not the only pitching mechanics metric that has changed since the meeting with Andrew Bailey. First, Giolito's extension has decreased slightly during his past six starts. While it is only a matter of inches, Giolito is now releasing the baseball slightly farther away from home plate. Additionally, the average horizontal and vertical release points change. From a horizontal perspective, Giolito is releasing the baseball closer to the plate. From a vertical perspective, Giolito is releasing the ball higher up off of the mound. These changes make sense physically: if a pitcher moves their arm angle closer to 90°, then their release points are taller but more centralized horizontally to the mound. Once again, these changes in release points aren't too drastic, but they go to show how one mechanical change (adjusting arm angle) can affect other pitching mechanic metrics as well.
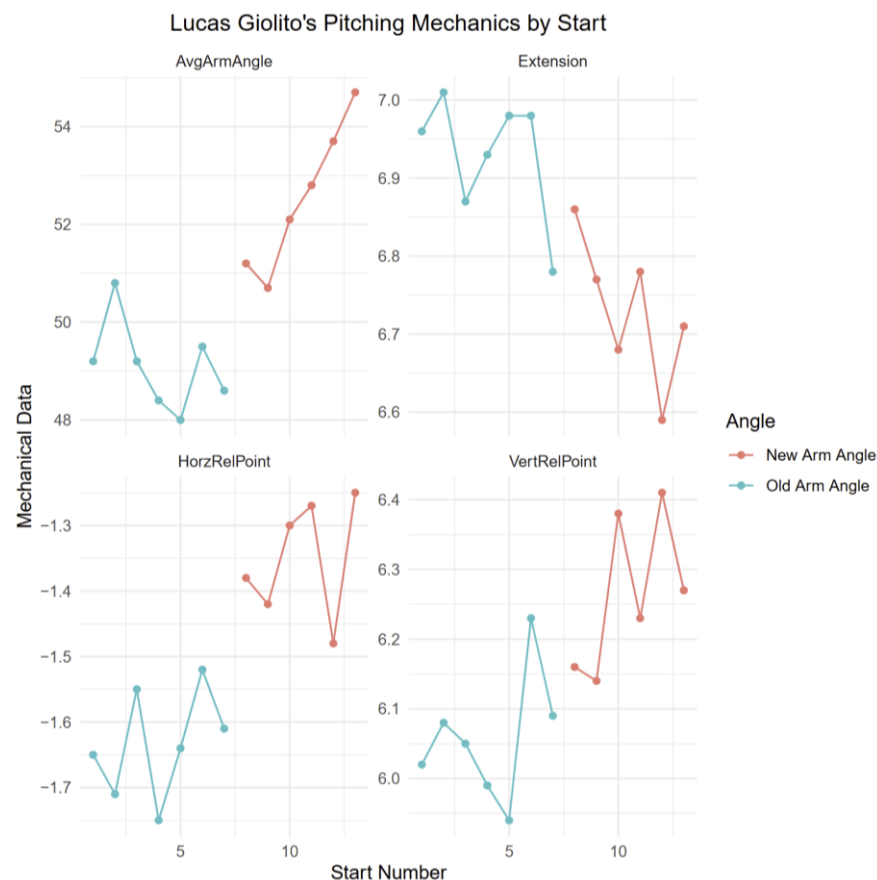

Figure 2: Facet plot showing Lucas Giolito's average arm angle, horizontal release point, vertical release point, and extension by start. This was made using the 'ggplot2' package in R.

Improvement in Strike-Throwing

Figure 3 below shows Giolito's strike percentage by start with a plotted estimate of 61% for a league average strike rate. It is evident from this plot that Giolito has been far more consistent with throwing strikes within his past six starts. During the first seven, Giolito's strike percentage was somewhat all over the place. In some of these starts, he maintained a strong strike rate above 65%. In others, especially the start against the Angels, he struggled to put the ball in the strike zone. Thankfully, his strike rate has improved in his most recent six starts, with Giolito even approaching 70% in his three most recent starts. This proves that the changes in mechanics helped Lucas Giolito as a strike-thrower.
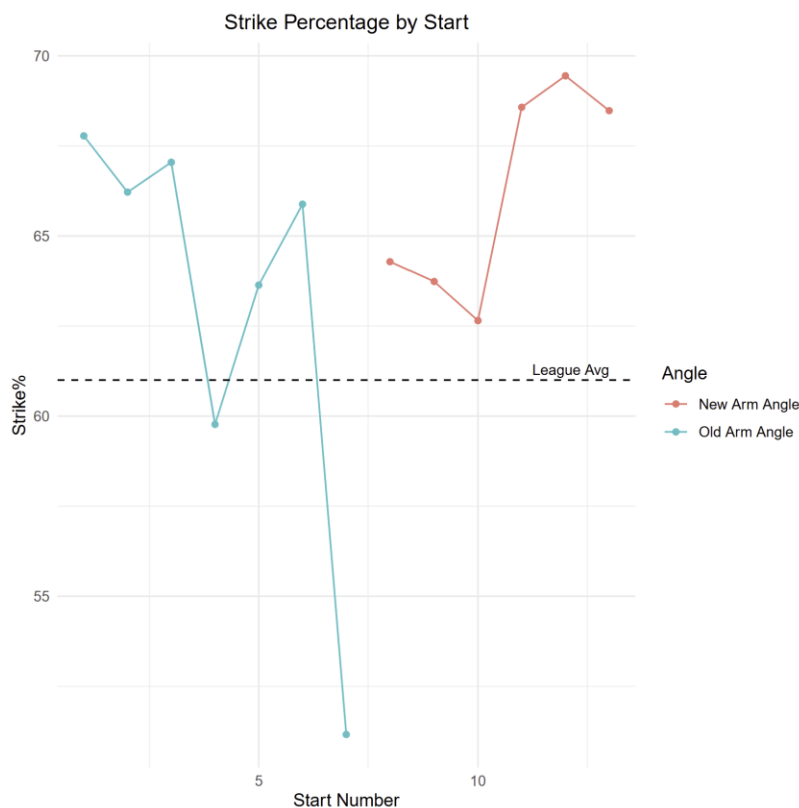

Figure 3: Plot showing Lucas Giolito's strike percentage by start. This was made using the 'ggplot2' package in R.

Pitch Selection

Figure 4 below shows how Lucas Giolito has utilized his pitch mix across his thirteen starts this season. The vertical black line, between starts seven and eight, represents the moment when Giolito had his meeting with pitching coach Andrew Bailey. Before this meeting, it is clear that Giolito primarily used his four-seam fastball the most, with his slider, changeup, and curveball being secondary pitches. As mentioned before, it is important to note that Giolito

himself said that he wanted to be more fastball-dominant with his new pitching mechanics. As a result, Giolito has used his four-seam fastball even more since the meeting with Bailey, shown by his fastball percentage staying above 50% across all six of his most recent starts. As a consequence, his slider and changeup rates have decreased slightly with his new pitching selection philosophy. This proves that Giolito has been successful in his goal of throwing more four-seam fastballs now that he is on top of the ball more.
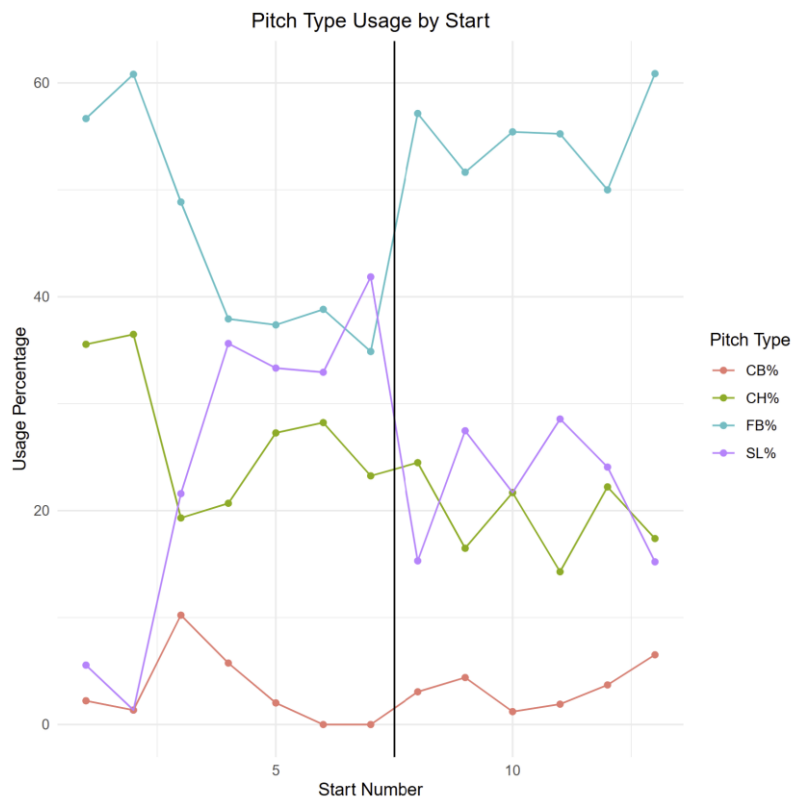

Figure 4: Plot showing Lucas Giolito's pitch mix by start. The black line, between the seventh and eighth start, shows when Giolito met with pitching coach Andrew Bailey. This was made using the 'ggplot2' package in R.

Improvement in Outcomes

Figure 5 below shows Lucas Giolito's outcomes by start during the 2025 season. Obviously, there are more than three outcomes of a plate appearance, but this plot focuses on strikeouts, hits, and walks, which make up the overwhelming majority of outcomes of all plate appearances. Once again, the vertical black line illustrates the moment when Giolito worked on his pitching mechanics. Before the changes, Giolito was getting hit hard in his starts, with opponent hit percentage being above 20% for a majority of his first seven starts. After the meeting, his opponent hit percentage cooled off significantly, and his strikeout rate has slightly rose. His walk rate has slightly improved, but there is still room for improvement in this area.
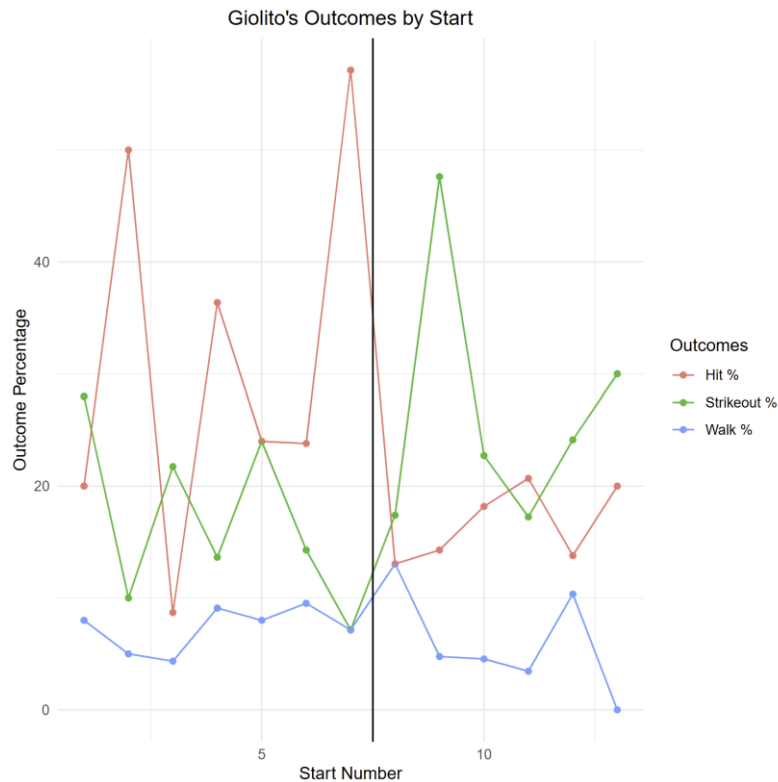
Figure 5: Plot showing Lucas Giolito's outcome percentages by start. The black line, between the seventh and eighth start, shows when Giolito met with pitching coach Andrew Bailey. This was made using the 'ggplot2' package in R.

Conclusions and Future Research

Several conclusions can be made about the divide between Lucas Giolito's first seven starts and his most recent six. First, it is clear that he has made some modifications to his pitching mechanics. His average arm angle has increased and is still on the rise, with Giolito having a more 'over-the-top' throwing motion in his last six starts. This is not the only significant mechanical change, as his extension, horizontal release point, and vertical release point have also been altered. In addition to these mechanical changes, he is throwing more four-seam fastballs and fewer sliders. These mechanical and pitch arsenal changes have contributed to an increase in success on the mound. In his most recent six starts, Giolito has thrown more strikes, struck out more batters, and given up less hits. These improvements illustrate that his work with pitching coach Andrew Bailey has been successful.

Future research should be done at the end of the season to see if Giolito's changes in mechanics and his improved performance on the mound continue. Although it is easy to say that Giolito's season has been saved, it is important to note that this study relies on just the first six starts since the meeting with pitching coach Andrew Bailey. This is a small sample size relative

to an entire season's workload, so repeating this study at the end of Boston's season would be beneficial in order to see just how impactful the midseason adjustments are.

Another future study could look at pitchers who are in a similar situation as Lucas Giolito. As mentioned earlier, he suffered a season-ending elbow injury in spring of 2024, meaning 2025 is his first full season as a starter after a serious arm injury. Perhaps the adjustments that Giolito made to his pitching motion and arsenal could be beneficial to other pitchers who have recently suffered a significant arm injury. For example, the Red Sox signed Walker Buehler this past offseason to a one-year deal after he won the World Series with the Los Angeles Dodgers. Like Giolito, 2025 is Buehler's first full season starting after a significant elbow injury he recently suffered. To put it lightly, Buehler has struggled to find his way in 2025 as a full-time starter. Maybe changes to his pitching motion and pitch arsenal could be beneficial to Buehler, as well as other starters across professional baseball who have recently suffered a major injury.

References

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