

Association of the Universal Designated Hitter Rule With Changes to Injuries in Major League Baseball Pitchers

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Background: In 2022, Major League Baseball (MLB) implemented the universal designated hitter (DH) rule, thus allowing the pitcher to focus solely on defense while the DH, who bats for the pitcher, focuses solely on offense.

Purpose/Hypothesis: The purpose of our study was to determine if implementation of the universal DH rule affected the incidence of injuries in MLB pitchers when compared with before implementation. It was hypothesized that the shift to the universal DH rule would be associated with a decrease in the rate of offense-related pitcher injuries.

Study Design: Descriptive epidemiology study.

Methods: Using publicly available data, we identified injuries sustained by MLB pitchers during the 2021 (before the DH rule change) and 2022 (after the rule change) regular seasons. Pitchers placed on the injured list for non-gameplay related reasons were excluded. Statistical analysis was performed with the chi-square and independent *t* tests.

Results: The injury incidence rate decreased significantly from before to after the rule change for MLB pitchers overall (from 6.58 to 5.60 injuries/1000 athlete game-exposures [AGE]; $P = .02$) and for National League pitchers (from 7.62 to 6.26 injuries/1000 AGE; $P = .04$). No significant changes were seen in American League pitchers ($P = .20$). Injury locations that decreased from before to after the rule change were the thigh (from 0.52 to 0.21 injuries/1000 AGE; $P = .003$) and the hand/finger/wrist (from 0.63 to 0.30 injuries/1000 AGE; $P = .01$). Total time lost decreased from 9471 days before the rule change to 8857 days after the rule change ($P = .00001$).

Conclusion: Implementation of the universal DH rule was associated with a decrease in pitcher injuries overall and within the National League. Injuries to the thigh and hand/finger/wrist also decreased overall and within the National League. Furthermore, total days lost decreased from before to after the rule change. These findings may be due to the elimination of offensive gameplay requirements for pitchers, which highlights a positive consequence of the universal DH rule, but further studies are needed.

Keywords: sports; baseball; pitchers; injury; orthopaedics

The designated hitter (DH) is defined by Major League Baseball (MLB) as a player who bats “in place of the pitcher” throughout the entirety of a game.¹³ In 1973, the DH was introduced into the MLB^{6,13}; however, only the American League (AL) embraced the DH originally. This meant that only games in which an AL team was the home team were played with a DH, while pitchers were involved in offensive gameplay if a National League (NL) team was the home team.⁶

Implementation of a universal DH, which would require every team in the MLB to adopt a DH for every single game played (as opposed to only AL teams), would allow pitchers to focus solely on their defensive roles while the DH focused solely on offense.¹³ After decades of debate, the universal DH rule was first tested during the 2020 MLB season,¹³ which was shortened due to COVID-19; however, it returned to pre-COVID-19 form in the 2021 season until the 2022-2026 collective bargaining agreement, in which the MLB adopted the universal DH rule indefinitely.¹³

Although the original DH rule debates were not centered around pitcher injuries, pitchers still had exposure for injury potential while playing offense after 1973. Participating in batting placed pitchers at risk of being hit by a pitch, which most often injured the hand/wrist and

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head/face areas.^{4,7,10,11} Running the bases also posed an injury risk: from 2011 to 2015, injury while sliding into a base transpired once every 336 slides and most often led to finger/hand injury.^{3,7,10,11} Additionally, running bases led to roughly 62% of thigh injuries in the MLB.¹¹

Pitchers are inherently at increased risk of injury due to the physical workload and demands of a professional season. From 2002 to 2008, MLB pitchers were at a 34% increased risk of injury compared with their position-player counterparts.¹⁸ They also show different injury patterns: injuries to the elbow, shoulder, and forearm are of higher incidence in pitchers than in position players, while injuries to the lower extremity and hand/wrist are of lower incidence for pitchers than position players.¹⁸

As pitchers in general carry a greater injury risk than position players, the purpose of our study was to determine if implementation of the universal DH rule in 2022 affected the incidence of injuries in MLB pitchers when compared with before implementation. We hypothesized that the universal DH rule will be associated with a decrease in the rate of offense-related pitcher injuries.

METHODS

Study Design

This study included MLB pitchers who sustained an injury during the 2021 and 2022 regular seasons. Seasons were defined as before the DH rule change (2021) and after the rule change (2022). Only complete, 162-game, post-COVID-19 seasons were included. We also believed that including seasons beyond the 2022 MLB season would result in nonrepresentative results and affect pitcher injuries due to the introduction of the MLB pitch clock for the 2023 season. This rule places a 15-second time limit between pitches with the bases empty and a 20-second time limit with runners on base. We believed that comparing the 2021 and 2022 MLB seasons was the best analysis of the impact of the universal DH rule because the rules and COVID-19 policies remained similar.⁵

Pitchers who participated in ≥ 1 MLB regular season game during the study period were included. Injuries from previous and subsequent seasons were excluded to minimize confounding variables. Data were collected using the following publicly available resources: MLB transactions,¹⁵ Fangraphs,⁹ Baseball-Reference,¹⁹ and ESPN.⁸ All injuries that were listed on the MLB transactions page were collected and were cross-referenced with the other mentioned sources to ensure that all publicly

available injuries were collected. A 2-author system (E.K. and K.L.) was used to collect and validate the accuracy of the data.

Injury Identification and Classification

Injuries that occurred from the first to the last day of the regular season during team-sanctioned gameplay and practice were included. Injuries during the preseason and postseason were not included due to inconsistent data and the unequal opportunity for teams to play in postseason games. An injury was defined as any tissue damage or derangement as a result of gameplay or practice that led to missing ≥ 1 games. Pitchers placed on the injured list (IL) for non-gameplay related injuries and illnesses were excluded. Only injuries that led a pitcher to be placed on the 10-day, 15-day, or 60-day IL (which are the only 3 possible injury IL designations) were included. Day-to-day injuries were not included due to inconsistency in reported data. Pitcher injuries were also stratified by anatomic region based on public reports of injury location.

Injury Incidence Rate

The injury incidence rate was calculated based on athlete game-exposure (AGE), similar to previous studies.^{15,18,19} AGE was calculated based on the following formula: $AGE = (\text{number of MLB teams} \times \text{number of regular-season games played} \times \text{number of players on roster}) / (2 \text{ teams per game})$. The incidence rate was converted to a seasonal rate using the formula $AGE \times 1000$. During the 2021 season, 26 players were on the roster. During the first 4 weeks of the 2022 season, 28 players were on the roster; this number was reduced to 26 players for the remainder of the season. For both seasons, 30 MLB teams played, 15 in the AL and 15 in the NL. For both seasons, 162 MLB games were played.

Days Lost

Days lost were calculated and compared for all players who sustained an injury during the MLB regular season and then returned to play in an MLB game in the same regular season. Players who did not play another game during the same regular season were excluded only from days-lost calculations due to an inability to accurately assess a return-to-play date.

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Ethical approval was not sought for the present study.

TABLE 1
Pitcher Injuries by League^a

Variable	Number of Injuries		P
	Before Rule Change	After Rule Change	
Overall MLB	448	381	.02
AL	207	183	.20
NL	241	198	.04

^aBoldface *P* values indicate statistically significant difference between groups (*P* < .05). AL, American League; MLB, Major League Baseball; NL, National League.

Player Characteristics

Player characteristics including date of injury, league, position, age, number of years played in the MLB and professionally, total innings pitched before injury, pitches thrown before injury within the game, injury diagnosis and location, type of treatment (surgical vs nonsurgical), and injury designation (10-day/15-day IL vs 60-day IL).

Statistical Analysis

The chi-square test was used to compare categorical variables, and the independent *t* test was used to compare continuous variables. Comparisons with *P* < .05 were considered significant. All statistical analysis was performed using SPSS Version 28.0.0 (IBM Corp).

RESULTS

Before implementation of the DH rule change (2021), there were 448 pitcher injuries over 63,180 athlete-exposures, and after the rule change (2022) there were 381 pitcher injuries over 63,540 athlete-exposures (Table 1). The injury incidence rate decreased significantly from before to after the rule change for pitchers overall (from 6.58 to 5.60 injuries/1000 AGE; *P* = .02) and for NL pitchers (from 7.62 to 6.26 injuries/1000 AGE; *P* = .04). There were no significant rule change–related differences in the injury incidence rate for AL pitchers (*P* = .20) (Table 2).

Regarding pitcher characteristics, the injury incidence rate decreased significantly from before to after the rule change for relievers (from 4.10 to 3.39 injuries/1000 AGE; *P* = .04), pitchers on the 60-day IL (from 2.17 to 1.60 injuries/1000 AGE; *P* = .02), and pitchers with nonsurgically treated injuries (from 6.33 to 5.21 injuries/1000 AGE; *P* = .01) (Table 2). Total time lost decreased significantly from 9471 days before the rule change to 8857 days after the rule change (*P* = .00001), and meantime lost increased significantly from 33.35 days before the rule change to 38.84 days after the rule change (*P* = .03).

The most frequent injury location in pitchers before the rule change was the shoulder (1.57 injuries/1000 AGE), followed by the elbow (1.06 injuries/1000 AGE). After the rule change, the most frequent injury location was also the

TABLE 2
Pitcher Injuries According to League and Pitcher Characteristics^a

Variable	Injury Incidence Rate		P
	Before Rule Change	After Rule Change	
League			
Overall MLB	6.58	5.60	.02
AL	6.56	5.80	.20
NL	7.62	6.26	.04
Position			
Reliever	4.10	3.39	.04
Starter	2.99	2.63	.24
Handedness			
Right	5.19	4.45	.06
Left	1.90	1.58	.18
Surgery			
Yes	0.76	0.82	.69
No	6.33	5.21	.01
IL designation			
10-/15-day	4.92	4.43	.20
60-day	2.17	1.60	.02

^aData are reported as No. of injuries/1000 athlete game-exposures. Boldface *P* values indicate statistically significant difference between groups (*P* < .05). AL, American League; IL, injured list; MLB, Major League Baseball; NL, National League.

shoulder (1.30 injuries/1000 AGE) followed by the elbow (1.11 injuries/1000 AGE), with no significant differences compared with before the rule change (*P* = .21 and .80, respectively) (Table 3). When evaluating NL pitchers only, injuries that decreased significantly from before to after the rule change occurred in the thigh (from 0.57 to 0.16 injuries/1000 AGE; *P* = .006) and the hand/finger/wrist (from 0.47 to 0.16 injuries/1000 AGE; *P* = .02). Injuries to these same regions also decreased significantly when evaluating all MLB pitchers (thigh: from 0.52 to 0.21 injuries/1000 AGE, *P* = .003; hand/finger/wrist: from 0.63 to 0.30 injuries/1000 AGE, *P* = .01). When evaluating AL pitchers, the incidence rates for all injuries remained unaffected by the rule change (Table 3).

DISCUSSION

We hypothesized that the universal DH rule would be associated with a decrease in the rate of offense-related pitcher injuries. Study findings indicated that the injury incidence rate significantly decreased from before to after the rule change in the league overall and in the NL. At the same time, it remained unchanged in the AL. Additionally, nonsurgical injuries and those on the 60-day IL significantly decreased from before to after the rule change. When stratifying by injury location, we found that thigh and hand/finger/wrist injuries significantly decreased from before to after the rule change, and these decreases were only found in the NL and in the league overall. Finally, the total days lost due to injury for pitchers who were not out for the

TABLE 3
Pitcher Injuries by Anatomical Region^a

Anatomical Region	AL Injuries ^b			NL Injuries ^b			Overall MLB Injuries ^b		
	Before Rule Change	After Rule Change	<i>P</i>	Before Rule Change	After Rule Change	<i>P</i>	Before Rule Change	After Rule Change	<i>P</i>
Shoulder	1.77; 56 (27.1)	1.23; 39 (21.3)	.08	1.36; 43 (17.8)	1.36; 43 (21.7)	.99	1.57; 99 (22.1)	1.3; 82 (21.5)	.21
Elbow	0.79; 25 (12.1)	0.92; 29 (15.8)	.58	1.33; 42 (17.4)	1.30; 41 (20.7)	.91	1.06; 67 (15.0)	1.11; 70 (18.4)	.80
Thigh	0.47; 15 (7.2)	0.25; 8 (4.4)	.14	0.57; 18 (7.5)	0.16; 5 (2.5)	.006	0.52; 33 (7.4)	0.21; 13 (3.4)	.003
Hand/Finger/Wrist	0.79; 25 (12.1)	0.44; 14 (7.7)	.08	0.47; 15 (6.2)	0.16; 5 (2.5)	.02	0.63; 40 (8.9)	0.3; 19 (5.0)	.01
Back	0.54; 17 (8.2)	0.41; 13 (7.1)	.47	0.79; 25 (10.4)	0.82; 26 (13.1)	.89	0.66; 42 (9.4)	0.62; 39 (10.2)	.74
Forearm	0.44; 14 (6.8)	0.35; 11 (6.0)	.55	0.70; 22 (9.1)	0.60; 19 (9.6)	.64	0.57; 36 (8.0)	0.47; 30 (7.9)	.46
Oblique	0.28; 9 (4.3)	0.41; 13 (7.1)	.39	0.47; 15 (6.2)	0.25; 8 (4)	.14	0.38; 24 (5.4)	0.33; 21 (5.5)	.65
Knee	0.22; 7 (3.4)	0.25; 8 (4.4)	.80	0.41; 13 (5.4)	0.25; 8 (4)	.28	0.32; 20 (4.5)	0.25; 16 (4.2)	.50
Upper arm	0.19; 6 (2.9)	0.19; 6 (3.3)	.99	0.32; 10 (4.1)	0.32; 10 (5.1)	.99	0.25; 16 (3.6)	0.25; 16 (4.2)	.99
Groin	0.32; 10 (4.8)	0.16; 5 (2.7)	.20	0.32; 10 (4.1)	0.25; 8 (4)	.64	0.32; 20 (4.5)	0.21; 13 (3.4)	.22
Lower leg	0.13; 4 (1.9)	0.28; 9 (4.9)	.17	0.19; 6 (2.5)	0.16; 5 (2.5)	.76	0.16; 10 (2.2)	0.22; 14 (3.7)	.41
Hip	0.09; 3 (1.4)	0.22; 7 (3.8)	.21	0.09; 3 (1.2)	0.16; 5 (2.5)	.48	0.09; 6 (1.3)	0.19; 12 (3.1)	.16
Ankle	0.13; 4 (1.9)	0.13; 4 (2.2)	.99	0.13; 4 (1.7)	0.19; 6 (3)	.53	0.13; 8 (1.8)	0.16; 10 (2.6)	.64
Foot/Toe	0.06; 2 (1.0)	0.00; 0 (0)	.16	0.22; 7 (2.9)	0.09; 3 (1.5)	.21	0.14; 9 (2.0)	0.05; 3 (0.8)	.08
Neck	0.16; 5 (2.4)	0.19; 6 (3.3)	.76	0.13; 4 (1.7)	0.06; 2 (1.0)	.41	0.14; 9 (2.0)	0.13; 8 (2.1)	.81
Abdomen	0.03; 1 (0.5)	0.06; 2 (1.1)	.56	0.00; 0 (0)	0.03; 1 (0.5)	.32	0.02; 1 (0.2)	0.05; 3 (0.8)	.32
Head	0.03; 1 (0.5)	0.03; 1 (0.5)	.99	0.03; 1 (0.4)	0.00; 0 (0)	.32	0.03; 2 (0.4)	0.02; 1 (0.3)	.56
Spine	0.06; 2 (1.0)	0.06; 2 (1.1)	.99	0.03; 1 (0.4)	0.09; 3 (1.5)	.32	0.05; 3 (0.7)	0.08; 5 (1.3)	.48
Ribs	0.00; 0 (0)	0.09; 3 (1.6)	.08	0.06; 2 (0.8)	0.03; 1 (0.5)	.56	0.03; 2 (0.4)	0.06; 4 (1.0)	.41
Pectoralis	0.03; 1 (0.5)	0.06; 2 (1.1)	.56	0.00; 0 (0)	0.00; 0 (0)	.99	0.02; 1 (0.2)	0.03; 2 (0.5)	.56

^aBoldface *P* values indicate statistically significant difference between groups ($P < .05$). AL, American League; MLB, Major League Baseball; NL, National League.

^bInjuries are reported as injury incidence rate (ie, No. of injuries per 1000 athlete game-exposures) and as No. (%) of injuries.

season significantly decreased from before to after the rule change. These findings supported our hypothesis and highlighted the positive consequences of implementing the universal DH rule.

To eliminate a possible confounding variable in our analysis, we compared only 162-game post-COVID-19 seasons (2021 vs 2022). The 2020 MLB season was shortened to 60 games due to COVID-19 and featured several irregularities compared with full 162-game seasons; therefore,

we excluded this season in our analysis. Platt et al¹⁷ and Martin et al¹⁴ reported that among many other factors, COVID-19 isolation protocols may have played a significant role in detraining athletes, leading to an increase in injury risk. Additionally, sudden game cancellations leading to abrupt training regimens and an increase in double-header gameplay also may have led to an increase in injury risk.^{14,17} It is likely that the shortened 2020 season due to COVID-19 did not give representative results for injury

incidence rates. Martin et al showed that the first 2 months of the 2020 shortened season experienced a significantly higher injury incidence rate than in the seasons before COVID-19. In the final month of this season, injury incidence rates trended more similarly toward complete 162-game seasons.

Overall and League-Based Pitcher Injury Incidence

When comparing the seasons before versus after the rule change, we noted a significant decrease in overall and NL pitcher injury incidence rates (but not those in the AL) before versus after the rule change. Elimination of offensive pitcher gameplay would predict a decrease in pitcher injuries due to the decreased need for dynamic movements related to baserunning and batting. Both overall and NL pitcher injury decreases are expected due to the increased offensive exposure before the rule change in the NL, as stated previously. Nonsurgical pitcher injuries decreased as well. This is likely due to the notion that most injuries related to batting and baserunning are not severe enough to require surgery. Hartnett et al¹¹ explained that the most common baserunning-related time-loss injury was a hamstring strain (5.7%), which is typically not treated surgically. Although 60-day IL designated injuries, which are given to the most severe injuries, decreased from before to after the rule change. This indicates that the rule change decreased injuries that were severe enough to cause pitchers to miss an extended period of time but not those that were severe enough to require surgical intervention. These are important findings that highlight the benefits of the universal DH rule from an injury incidence rate standpoint. However, these findings should be evaluated with caution due to the 2022 collective bargaining agreement rule that changed the minimum IL designation for pitchers from 10 days to 15 days, ultimately raising the threshold for being placed on the IL.

Injury Incidence by Anatomical Region

Shoulder, followed by elbow, injuries were the most seen injury locations in pitchers both before and after the rule change. This finding is similar to an epidemiological study done by Posner et al,¹⁸ which found that the most common injuries seen in pitchers were to the shoulder (30.7%) followed by the elbow (26.3%). The transfer of power through the kinetic chain and repetitive pitching motion involves extensive force to the shoulder and elbow, leading pitchers to sustain injuries to those locations at the highest rate.^{16,20}

When evaluating injury incidence rates by anatomical region, our study found that thigh injuries decreased from before to after the rule change in the MLB overall and in the NL. Before the implementation of the universal DH rule, NL pitchers had significantly higher exposure to offensive gameplay and, therefore, a higher risk for gameplay-related injury. Since the rule change for the AL only eliminated a nominal exposure before the rule change of 10 games per season of offensive gameplay for

pitchers during interleague play, we expect that injuries to all regions remain similar. In contrast, the decrease in thigh injuries in the NL is likely due to the elimination of offensive gameplay from pitchers. Mlynarek and Coleman¹⁶ and Swindell et al²⁰ indicated that the batting motion requires batters to activate an upward kinetic chain starting with a forward step and then generate power through their lower extremity to induce a powerful rotational force to hit the baseball. This repetitive motion leads to an increased risk of thigh injuries.^{16,20} Additionally, injuries to the thigh/hip/groin can also occur during baserunning due to the primary involvement of the lower extremity in the running mechanism.^{16,20} In an event where a pitcher puts a baseball in play, they are required to perform similar physical movements to position players. Pitchers spend significantly less time practicing proper batting and baserunning techniques. Therefore, the elimination of this gameplay requirement leads to a decrease in these common injuries.

Additionally, a decrease in injuries to the hand/finger/wrist was also observed in both the overall league and the NL, which may be due to decreased exposure to hit-by-pitch and improper sliding events. Finger fractures and dislocations can occur when sliding into a base with poor technique or bunting, as described by Camp et al.³ When a batter is attempting to bunt, he must lower his center of gravity, position one hand on the posterior side of the bat barrel, and move closer to the strike zone. This vulnerable position, combined with poor technique, places pitchers at a high risk for hit-by-pitch injuries to the hand/finger/wrist. Additionally, in a headfirst slide, the runner must fully extend his arm, hand, and fingers to give him the greatest chance of reaching that base safely. Similarly, this position, combined with improper technique, places pitchers at a higher risk of injuries to this location during a sliding event. These findings also support our hypothesis and highlight 1 of the positive consequences of this rule change. However, these findings should also be evaluated with caution due to the 2022 collective bargaining agreement.

Days Lost

When comparing changes before versus after the rule change, there was a decrease in days lost from the 2021 to 2022 seasons. This is likely due to the overall decrease in pitcher injury incidence rates. Surprisingly, the mean days lost increased from before to after the rule change. One possible explanation is the 2022 collective bargaining agreement rule, which increased the mean days lost due to the increased time spent on the IL.¹²

Limitations

This study is not without limitations. Only 1 season each from before and after the rule change was able to be evaluated due to confounding variables of the 2020 shortened COVID-19 season and the implementation of the pitch clock for the 2023 season. Day-to-day injuries were not

included in this analysis due to inconsistent public reporting, though they may have provided more high-yield results. No minor league or international league players were evaluated, decreasing the generalizability of our data to other leagues. Furthermore, the use of public data has limitations on the accuracy of our data. Missing or improperly reported data by external sources may be included in the data. Additionally, the lack of access to official player medical records prevents us from obtaining the most precise injury location and injury diagnosis. With that stated, external validation was performed to increase the reliability of the data, and information found on public sources is generally accurate due to direct communication with MLB organizations. Also, using publicly available data for similar studies is an accepted practice and has been seen in recent publications.^{1,2,4,14,16} Injury diagnosis and injury pathology were inconsistently reported leading to decreased clinical interpretability of the results. Game exposures were estimated based on overall games played in a season, similarly to previous studies. Individual players may experience different gameplay exposures; and those were not able to be calculated based on these data. Also, the 2022 collective bargaining agreement, which increased the minimum IL placement for pitchers from 10 days to 15 days, limits our ability to draw a stronger conclusion from our results. Finally, implementation of this rule change during the COVID-19 pandemic may have influenced injury incidence rates and should be evaluated with caution. Future studies are needed to evaluate this rule change without confounding variables that were unavoidable in this study.

CONCLUSION

Our study showed that the implementation of the universal DH rule was associated with a decrease in overall and NL pitcher injuries. Additionally, decreases in nonsurgical injuries and those designated as 60-day IL were seen from before to after rule implementation, and injuries to the thigh and hand/finger/wrist decreased in both the NL pitchers and pitchers overall. Furthermore, total days lost decreased from before to after the rule change. These findings may be due to the elimination of offensive gameplay requirements for pitchers, which highlights a positive consequence of the universal DH rule, but further studies are needed.

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