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## How does the All-Star break affect injury rates in professional baseball?



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### ARTICLE INFO

#### Keywords:

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**Background:** Injury rates in professional baseball players are increasing. It is unclear if the time of rest from the All-Star break affects injury risk

**Methods:** Every professional baseball game (A-, A+, AA, AAA, and Major League Baseball) played between 2011 and 2017 was included. Each game was then classified as control game (games played in April, May, June, and September) or game within one month after the All-Star break. Incidence of injuries in games within one month of the All-Star break was compared with the control games.

**Results:** Our analysis included 66,642 games: 46,630 control games and 20,012 games played within one month after the All-Star break. On univariate analysis, there was a mean  $\pm$  standard deviation of  $0.45 \pm 0.72$  injuries per game in control games and  $0.41 \pm 0.68$  injuries per game in games played within one month after the All-Star break ( $P < .001$ ). On multivariate analysis, there was a significant association between games played within one month after the All-Star break and number of injuries per game ( $P < .001$ ) after adjusting for the level of play and game duration. However, the effect size was 0.001, suggesting this effect is clinically insignificant.

**Conclusion:** There does not appear to be a clinically significant difference in injury rates per game in professional baseball players between games played in the month after the All-Star break and all other games played during the season. Although the All-Star break provides most players with a chance to rest, it does not appear to have an effect on injury rates.

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Professional baseball has one of the most grueling seasons in all sports. Players report to spring training and play several games for nearly a month before beginning a 162-game regular season, potentially capped with a month of playoff games. This length of season exposes the players to risk of both acute, traumatic injuries such as muscle tears and shoulder dislocations as well as chronic, overuse injuries such as tendonitis.<sup>3</sup> Despite an increased focus on injury prevention, injury rates in professional baseball have been on the rise over the last 10 years.<sup>3,6</sup>

Although some risk factors for injury including loss of shoulder range of motion, loss of hip range of motion, geography, pitch velocity, pitching while fatigued, and many others have been determined, no studies to date have evaluated the effect of mid-season rest (days off) on injury rates.<sup>4,5,7-9,12,13</sup> Most professional sports

have an All-Star break in the middle of the season to afford most players a short period of time off for rest and recovery. However, it is unclear if this time off has any effect, either positive or negative, on injury risk. If this time off were to dramatically decrease injury risk in the subsequent month, a case could be made to implement a second break in the season or otherwise alter the schedule so as to increase rest time in an effort to decrease injury rates.

Therefore, the purpose of this study was to determine whether the incidence of injuries per game in professional baseball players differed in games played during the month after the All-Star break from games played during the rest of the regular season. The authors hypothesize that the incidence of injuries will be lower in games played in the month after the All-Star break than that in the rest of the regular season in professional baseball players.

### Methods

This study was performed with the approval of the Major League Baseball (MLB) Research Committee. The Commissioner's Office of

This study was approved by the Major League Baseball Players Association. This investigation was performed at the University of Utah (Salt Lake City, UT).

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MLB provided a list of every professional baseball game that was played between 2011 and 2017, which included the game duration in minutes and the level of play (A-, A+, AA, AAA, and MLB). Each game played has a unique identifier known as the game ID. Injuries from each game were recorded in the MLB Health and Injury Tracking System (HITS) database. HITS is a centralized database that contains deidentified player information. It was developed as a league-wide injury surveillance system in 2010 to record player injuries and injury time.<sup>11</sup> HITS has been used in several prior studies and has been found to be a reliable source of information.<sup>2,3</sup> Each in-game injury within HITS was associated with a game ID, and using this unique identifier, the two databases were linked. We then determined the number of injuries per game for each game. Thereafter, each game was classified as a control game (games played in April, May, June, and September) or a game within one month after the All-Star break. The All-Star Game dates over the study period were 7/12/2011, 7/10/2012, 7/16/2013, 7/15/2014, 7/14/2015, 7/13/2016, and 7/12/2017. Data from games played in March, October, and July before the All-Star break (and including the All-Star Game itself) were excluded to avoid potential effects from the early season, postseason, and schedule variations in the exact positioning of the All-Star break between years. Games in August more than one month removed from the All-Star break were included as control games.

**Statistics**

All analyses were conducted in Excel, version 16, (Microsoft, Redmond, WA, USA) and SPSS, version 26, (IBM, Armonk, NY, USA). We conducted a multivariate analysis of variance with number of injuries per game as the dependent variable and the following independent variables: level of play, game duration in minutes, and whether the game was within one month after the All-Star break or within the control group. The level of play and game duration were included in the analysis as they have been shown to be associated with the number of injuries per game in prior analyses.<sup>3</sup> From this analysis, we determined whether each variable significantly associated with the number of injuries per game via the *P* value, with 0.05 set *a priori* as the demarcation of statistical significance. We also determined the clinical importance of each variable using the effect size. The predictive power of the overall model was estimated using the *R*<sup>2</sup> value. Finally, estimated means were calculated for injury number per game relative to the All-Star break after accounting for other variables.

**Results**

Our analysis included 66,642 games, 46,630 control games, and 20,012 games played within one month after the All-Star break. On a univariate analysis, there were a mean ± standard deviation of 0.45 ± 0.72 injuries per game in the control games and 0.41 ± 0.68 injuries per game in the games played within one month after the All-Star break (*P*<.001). Of these games, 19% (12,955/66,642) were major league games, 20% (13,184/66,642) were AAA games, 19% (12,955/66,642) were AA games, 19% (12,833/66,642) were high A (A+) games, and 19% (12,686/66,642) were low A (A-) games.

On multivariate analysis, there was a significant association between games played within one month after the All-Star break and number of injuries per game (*P*<.001) after adjusting for the level of play and game duration. However, the effect size was 0.001 (Table I), suggesting that this effect is clinically insignificant (Fig. 1).

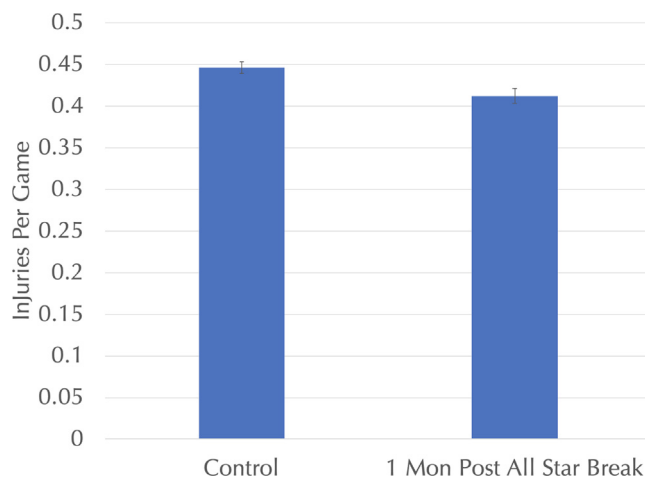
**Discussion**

Injury rates in professional baseball players are continuing to rise despite a recent focus on injury prevention efforts. The authors'

**Table 1**  
The *P* value and effect size for the association between each variable and the number of injuries per game in a multivariate analysis of variance within both Major and Minor League Baseball Games.

Variable	<i>P</i> value	Effect size
Game duration	<.001	0.016
Level of play	<.001	0.011
After All-Star break	<.001	0.001

The overall model had an *R*<sup>2</sup> of 0.04. Bold value indicates statistical significance.



**Figure 1** This estimated mean plot of number of injuries per game for games in March, April, June, and September as compared with games within one month after the All-Star break, after adjusting for game duration and level of play. (Mon = month).

hypothesis was partially correct, as there was a statistically significant but likely clinically insignificant difference in the incidence of injuries in games played in the month after the All-Star break compared with the rest of the regular season in professional baseball players. This suggests that the addition of a second break or the alteration of the regular season game schedule to increase the number of rest periods would not be expected to decrease injury rates.

In an effort to decrease injury rates in baseball players, several recent studies have evaluated various risk factors for injury at all ages and levels of play. Fleisig et al performed a 10-year prospective study in adolescent baseball players and found that pitchers who threw more than 100 innings per year were 3.5 times more likely to be injured than those who threw fewer than 100 innings per year.<sup>9</sup> Hibberd et al found that high-school pitchers who were also catchers had a 2.9 times higher risk of injury than pitchers who did not also play a catcher.<sup>10</sup> Wilk et al found that loss of passive glenohumeral motion, specifically loss of total arc of motion and loss of external rotation, was a significant risk factor for shoulder and elbow injury in professional baseball players.<sup>12,13</sup> Chalmers et al found that pitchers with higher average and peak pitch velocity were significantly more likely to undergo an ulnar collateral ligament reconstruction than pitchers who threw lower-velocity pitches.<sup>5</sup> Although these studies have provided evidence that has led to implementation of injury prevention programs, some of these risk factors are not modifiable. However, there may be several modifiable risk factors for injury that remain unexamined. Time off during the season is one of these factors.

Since 1903 when the American League and National League began cooperating before merging into a single organization in 2000, the MLB season has seen several modifications, including the introduction of the All-Star break in 1933.<sup>1</sup> The All-Star break is a time to showcase specific skills (Home Run Derby) and allow the

best players from both the American League and National League to compete with and against one another. However, there is a secondary purpose to this mid-season break, and that is to allow players, as well as coaches and staff, to rest before the second half of the season. This study found that the All-Star break does not appear to have a clinically significant effect on injury rates in the immediate games after the break compared with the rest of the season. This is an interesting finding as it means that a short period of time off during the course of the season does not appear to affect injury rates, either negatively or positively.

Although many might think consecutive days off would positively affect injury rates as players return more rested, it is also possible that the All-Star break could negatively impact injury rates as players are not performing their usual strength and conditioning routines and could come back from the All-Star break mildly deconditioned. However, neither of these outcomes were found in this study. These two effects may also negate one another. As such, there does not appear to be a need to alter the current season layout to prevent injuries. One interesting aspect that this study could not account for is the effect of the All-Star break on players', coaches', and so on mental health. Further work is needed to understand the effect of prolonged rest, including down time between playoff series, on injury rates and mental health. However, based on this study, it does not appear a short break has any effect on injury rates, either positive or negative, in professional baseball players.

### Limitations

Although the physicians, trainers, and therapists who enter information into the data sets that were used in this study take great care in entering information correctly, it is possible there were inaccuracies during information entry. However, even if this did occur, it is unlikely that this would have significantly affected the results given the size of the data sets. In addition, players who participated in the All-Star Game each year were included in the analysis, as they still were afforded time off for the All-Star break (albeit less time off than players who did not participate in the All-Star game).

### Conclusion

There does not appear to be a clinically significant difference in injury rates per game in professional baseball players between games played in the month after the All-Star break and all other games played during the season. Although the All-Star break provides most players with a chance to rest, it does not appear to have an effect on injury rates.

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### References

1. Almanac B. Major League Baseball All-Star Game History by Baseball Almanac. 2019. Available at: <https://www.baseball-almanac.com/asgmenu.shtml>. Accessed January 6, 2022.
2. Camp CL, Conte S, D'Angelo J, Fealy SA. Epidemiology of ulnar collateral ligament reconstruction in Major and Minor League Baseball pitchers: comprehensive report of 1429 cases. *J Shoulder Elbow Surg* 2018;27:871-8. <https://doi.org/10.1016/j.jse.2018.01.024>.
3. Camp CL, Dines JS, van der List JP, Conte S, Conway J, Altchek DW, et al. Summative Report on Time Out of Play for Major and Minor League Baseball: An Analysis of 49,955 Injuries From 2011 Through 2016. *Am J Sports Med* 2018;46:1727-32. <https://doi.org/10.1177/0363546518765158>.
4. Camp CL, Spiker AM, Zajac JM, Pearson S, Sinatro AM, Dines JS, et al. Decreased Hip Internal Rotation Increases the Risk of Back and Abdominal Muscle Injuries in Professional Baseball Players: Analysis of 258 Player-seasons. *J Am Acad Orthopaedic Surgeons* 2018;26:e198-206. <https://doi.org/10.5435/JAAOS-D-17-00223>.
5. Chalmers PN, Erickson BJ, Ball B, Romeo AA, Verma NN. Fastball Pitch Velocity Helps Predict Ulnar Collateral Ligament Reconstruction in Major League Baseball Pitchers. *Am J Sports Med* 2016;44:2130-5. <https://doi.org/10.1177/0363546516634305>.
6. Conte S, Camp CL, Dines JS. Injury Trends in Major League Baseball Over 18 Seasons: 1998–2015. *Am J orthopedics (Belle Mead NJ)* 2016;45:116-23.
7. Erickson BJ, Harris JD, Tetreault M, Bush-Joseph C, Cohen M, Romeo AA. Is Tommy John Surgery Performed More Frequently in Major League Baseball Pitchers From Warm Weather Areas? *Orthop J Sports Med* 2014;22325967114553916. <https://doi.org/10.1177/2325967114553916>.
8. Erickson BJ, Sgori T, Chalmers PN, Vignona P, Lesniak M, Bush-Joseph CA, et al. The impact of fatigue on baseball pitching mechanics in adolescent male pitchers. *J Arthrosc Relat Surg* 2016;32:762-71. <https://doi.org/10.1016/j.arthro.2015.11.051>.
9. Fleisig GS, Andrews JR, Cutter GR, Weber A, Loftice J, McMichael C, et al. Risk of serious injury for young baseball pitchers: a 10-year prospective study. *Am J Sports Med* 2011;39:253-7. <https://doi.org/10.1177/0363546510384224>.
10. Hibberd EE, Oyama S, Myers JB. Rate of Upper Extremity Injury in High School Baseball Pitchers Who Played Catcher as a Secondary Position. *J Athletic Train* 2018;53:510-3. <https://doi.org/10.4085/1062-6050-322-16>.
11. Pollack KM, D'Angelo J, Green G, Conte S, Fealy S, Marinak C, et al. Developing and Implementing Major League Baseball's Health and Injury Tracking System. *Am J Epidemiol* 2016;183:490-6. <https://doi.org/10.1093/aje/kwv348>.
12. Wilk KE, Macrina LC, Fleisig GS, Aune KT, Porterfield RA, Harker P, et al. Deficits in glenohumeral passive range of motion increase risk of elbow injury in professional baseball pitchers: a prospective study. *Am J Sports Med* 2014;42:2075-81. <https://doi.org/10.1177/0363546514538391>.
13. Wilk KE, Macrina LC, Fleisig GS, Aune KT, Porterfield RA, Harker P, et al. Deficits in Glenohumeral Passive Range of Motion Increase Risk of Shoulder Injury in Professional Baseball Pitchers: A Prospective Study. *Am J Sports Med* 2015;43:2379-85. <https://doi.org/10.1177/0363546515594380>.