Aggressive Enforcement Against Foreign Substance Use Did Not Increase the Number of Upper Extremity Injuries in Major League Baseball Players

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Introduction

Pitching is a highly complex movement that places significant biomechanical strain on the body, especially as pitchers strive to throw at higher velocities [1-4]. Over time, the repetitive nature of these motions and the constant strain on pitchers increase the risk of injury, particularly in the upper extremities [5-7]. Changes to pitcher biomechanics, whether due to training modifications or external factors such as rule adjustments, can introduce new strain patterns and further elevate the risk of injury [1-5]. On June 15, 2021, Major League Baseball (MLB) announced stricter enforcement of foreign substance use by pitchers. Since then, there has been speculation about an increase in season-ending upper extremity injuries among MLB pitchers, though limited published data is available on the subject.

Objective

To determine whether the strict enforcement of the foreign substance rule has led to an increase in season-ending upper extremity injuries among MLB pitchers.

Methods

A retrospective cohort study of all MLB pitchers from 2020 to 2022 was performed utilizing publicly available data on player movement to and from the injured list (prosportstransactions.com). Only upper extremity season-ending injuries (SEI) suffered by players whose primary position was listed as "pitcher" were considered for this study. An injury that resulted in a pitcher's inability to return to play at least 10 games before the end of the regular season was classified as an SEI. All injuries sustained after the 153rd game of the season was excluded from analysis. Pitcher demographics, average number of pitches thrown per game, and pitch-specific metrics (baseballsavant.mlb.com) were analyzed for each pitcher on the injured list. R version 4.4.0 (2024-04-24) was utilized for statistical calculations and a p value of ≤ 0.05 was considered significant. Differences between categorical variables were analyzed with the Chi-Square test and continuous variables were analyzed using a t-test.

Results

Table 1: Sticky Substance Ban and Season-Ending Upper Extremity Injuries

	No Season Ending Injury	Season Ending Injury	*P* value*
Pre-Substance Ban	1500	100	= 0.55
Post-Substance Ban	1402	103	= 0.55

Note: Pearson's Chi-squared contingency table test shown above
** Statistical significance defined as $P < 0.05$*

Table 1: There was no significant difference in upper extremity SEI among MLB pitchers before (6.0%) and after (6.3%) the enforcement of the foreign substance ban.

MLB Pitcher Demographics and Pitching Metrics	
Category	**p-value***
Pitcher Demographics	
Height (meters)	> 0.05
Weight (kilograms)	> 0.05
BMI	> 0.05
Age	> 0.05
Pitch Metrics	
Pitches Per Game	> 0.05
Release Speed	> 0.05
Release Extension	> 0.05
Horizontal Movement	> 0.05
Vertical Movement	> 0.05
Pitch Velocity in the X-Dimension	> 0.05
Pitch Velocity in the Y-Dimension	> 0.05
Pitch Velocity in the Z-Dimension	> 0.05
Pitch Acceleration in the X-Dimension	> 0.05
Pitch Acceleration in the Y-Dimension	> 0.05
Pitch Acceleration in the Z-Dimension	> 0.05

*Note: *Mann-Whitney U Test; Statistical significance defined as $p < 0.05$*

Table 2: No significant difference in MLB pitcher demographics or pitching metrics before and after the enforcement of the foreign substance ban.

Discussion

The primary goal of this study was to assess whether the stricter enforcement of the foreign substance ban in Major League Baseball (MLB) was associated with an increase in upper extremity SEI among pitchers. While it was initially hypothesized that the new enforcement policies might lead to an increase in upper extremity injuries due to potential changes in pitching mechanics or pitcher performance, our results do not support this hypothesis.

Our analysis found no significant difference in the incidence of upper extremity SEIs between pitchers in the pre- and post-aggressive substance ban enforcement groups. This suggests that the recent enforcement of the foreign substance ban has not had a discernible impact on the overall rate of upper extremity injuries in MLB pitchers. Additionally, there were no significant differences in key variables such as pitching mechanics, including pitch velocity, release speed, or acceleration across different dimensions, between the two groups.

Despite the lack of a significant association between the enforcement of the foreign substance ban and upper extremity injuries in this study, it is important to recognize that pitching is a highly dynamic activity influenced by various factors beyond substance use, such as training, fatigue, and biomechanics [1-5]. This study does not rule out the possibility that certain aspects of pitching mechanics, potentially influenced by the ban, could contribute to injuries, but further research is required to explore these relationships in greater depth. For example, the impact of altered grip strength or changes in pitch selection due to the ban could influence injury risk in ways that are not immediately apparent through the overall injury rates. Furthermore, while this study focused on season-ending injuries, which represent severe cases, it is possible that less severe injuries that might accumulate over time or those not requiring placement on the injured list could have different patterns.

Conclusion

The data presented here does not support the notion that the stricter enforcement of the foreign substance ban has led to an increased incidence of upper extremity SEIs in MLB pitchers. While the findings suggest that the ban can continue to be enforced without elevating injury risk, it is crucial that future studies delve deeper into the nuances of pitching biomechanics and injury mechanisms to further understand the complex relationship between substance use, pitching performance, and injury risk.

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References

Midwestern University