Recovery from hamstring injuries in Major League Baseball players

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Abstract

Background: Hamstring injuries in Major League Baseball result in man-games lost and medical costs that impact the player and team. Research question: How does a hamstring injury affect a baseball player’s subsequent performance? Type of study: Descriptive study. Methods: Major League Baseball players (non-pitchers) with a hamstring injury were identified over four seasons. Demographic data and days on the disabled list were recorded. Games played and at-bats were analysed for 2 seasons before injury, the season of injury, and 2 seasons following injury. Results: Mean age was 30.7 ± 4.1 years (range, 21 to 39). Mean days on the disabled list was 15.9 ± 5.9 days. Games played for each season before injury were significantly greater than for the season of injury (p = 0.002 and p = 0.003 respectively). Games played for each season following injury were not significantly different than for the season of injury (p = 0.262 and p = 0.083 respectively). At-bats for each season before injury were significantly greater than the season of injury (p = 0.010 and p = 0.007 respectively). At-bats for each season following injury were not significantly different than the season of injury (p = 0.263 and p = 0.074 respectively). Seventeen players played one or less seasons after injury. Conclusions: Most players with hamstring injuries returned to their same level following injury. However, this study identified a subset of players where a hamstring injury heralds the end of their career. These results can guide future preventive and rehabilitation protocols of hamstring injuries. Keywords: hamstring, injury, baseball, Major League, disabled list

Introduction

Hamstring injuries are a common in all sports. A recent report of Major League Baseball (MLB) players estimated that among position players hamstring injuries are the most common lower extremity injuries, and second most common overall. Purported risk factors for hamstring injuries across all sports include previous injury, reduced hip flexor flexibility, hip weakness, and reduced core stability. These injuries often result in a significant loss of time from sport for the individual player.

MLB rules allow players with a verified injury to be placed on a 15-day disabled list (DL). To be placed on the DL, the player must be certified by the team physician as unable to play, with a specific diagnosis. Placement on the DL is then approved by the Office of the Commissioner. Once on the DL, the player...
cannot return to the active roster for a minimum of 15 days. (As long as the player did not appear in a game during the retroactive period, a MLB 15-day DL assignment can be backdated up to ten days during the regular season). The player can remain on the DL for as many days as necessary for him to be ready to return to play. There may be non-medical factors specific to each team that also determine length of stay on the DL (e.g. performance of replacement player, clubhouse social and general managerial issues, etc.)

Earlier reports have suggested that injuries in MLB are not decreasing. Most of the injuries reported on the disabled list occur early in the season or pre-season, which can potentially affect a player’s performance for the remainder of the season. In this study, the author sought to characterise the epidemiology of hamstring strains occurring among position players in MLB and its association with future return to play.

Materials and methods
The MLB DL was retrospectively reviewed from seasons 2002 to 2005. All players on the DL with a listed injury as “hamstring strain,” “hamstring pull,” “hamstring tear,” or “hamstring injury” were identified as the initial subject. Seventy injury were identified as the initial subject “hamstring pull,” “hamstring tear,” or “hamstring strain,” with a listed injury as “hamstring strain,” “hamstring pull,” “hamstring tear,” or “hamstring injury” identified as the initial subject population. Seventy-six players were identified. Since hamstring injuries occur much less commonly in pitchers (3.3% of all injuries) compared to all other position players (13.7% of all injuries), all the pitchers were excluded from the analysis. If a player was placed on the DL for a hamstring injury more than once on non-consecutive occasions during the study period, the second injury was noted but the analysis was based on the index injury.

Data analysis
Height, weight, position played, hand dominance, and age at time of injury were recorded, and each player’s body mass index (BMI) was calculated. Number of days on the DL for the hamstring injury was recorded. The month of the season when the hamstring injury occurred was recorded. The number of MLB game appearances and official at-bats were recorded for each of the two seasons prior to injury, the season of injury, and the two seasons following the injury.

Totals are reported as means with standard deviation. Analysis of variance was conducted to compare age and BMI with the number of days on the DL. Paired t-tests were used to compare game appearances and official at-bats between seasons before the injury and seasons after injury with the season of injury.

Results
During the study period, 75 players were identified on the DL as having a hamstring injury of some kind. Fourteen were pitchers and subsequently excluded. Three players were placed on the DL for hamstring injury on two non-consecutive occasions during the study period and so the second injury was excluded from the analysis. Therefore 58 position players met the inclusion criteria and form the basis of the analysis (Table 1). Twenty-six players were outfielders, 25 were infielders, 5 were catchers, and 2 played first base and outfield.

Table 1: Demographic characteristics of Major League Baseball players (non-pitchers) who sustained a hamstring injury

<table>
<thead>
<tr>
<th>Number of Players</th>
<th>58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (years)</td>
<td>30.7 ± 4.1</td>
</tr>
<tr>
<td>Mean Height (cm)</td>
<td>183.5 ± 6.0</td>
</tr>
<tr>
<td>Mean Weight (kg)</td>
<td>90.4 ± 7.9</td>
</tr>
<tr>
<td>Mean BMI (kg/m²)</td>
<td>26.9 ± 2.6</td>
</tr>
<tr>
<td>Mean days on the DL</td>
<td>15.9 ± 5.9</td>
</tr>
</tbody>
</table>

BMI = Body Mass Index; DL = Disabled List

The mean age at the time of injury was 30.7 ± 4.1 years (range: 21 to 39). Twenty-eight players were left-hand dominant and 30 players were right-hand dominant. The mean height was 183.5 ± 6.0 cm (range: 168 to 201). The mean weight was 90.4 ± 7.9 kg (range: 75 to 105). The mean calculated BMI was 26.9 ± 2.6 (range: 22.4 to 38.1). The mean length of stay on the DL was 15.9 ± 5.9 days. However, 56 of 58 players were on the DL for 15 days, while the other 2

were on the DL for 23 and 60 days, respectively. There was no significant correlation between ages ($p > 0.20$) or BMI ($p > 0.15$) with length of stay on the DL. Most of the hamstring injuries (48%) occurred during the first two months of the season and spring training (Figure 1).

Figure 1: The stratification of hamstring injuries occurring each month of the MLB season

The mean number of MLB game appearances during the season of injury was $87.6 \pm 40.1$ games (Figure 2). The mean number of MLB game appearances for one and two seasons prior to injury were $105.1 \pm 44.1$ and $108.6 \pm 45.0$ games, respectively, and significantly greater than for the season of injury ($p=0.002$ and $p = 0.003$ respectively). The mean number of MLB game appearances for one and two seasons after injury were $82.2 \pm 52.1$ and $75.6 \pm 57.4$ games, respectively, and not significantly different than for the season of injury ($p = 0.263$ and $p = 0.083$ respectively). Nine players did not play another season after the season of injury, and eight other players only played one more season after the season of injury.

Figure 2: Mean number (± standard error) of MLB games played each season (before, during and after the season of hamstring injury)
The mean number of official MLB at-bats during the season of injury was $289 \pm 163$ (Figure 3). The mean number of official MLB at-bats for one and two seasons prior to injury were $348 \pm 187$ and $371 \pm 187$, respectively, and significantly greater than the season of injury ($p = 0.010$ and $p = 0.007$ respectively). The mean number of official MLB at-bats for one and two seasons after injury were $269 \pm 199$ and $247 \pm 212$, respectively, and not significantly different than the season of injury ($p = 0.263$ and $p = 0.074$ respectively). Nine players did not play another season after the season of injury, and eight other players only played one more season after the season of injury.

Figure 3: Mean number ($\pm$ standard error) of official MLB at-bats each season (before, during and after the season of hamstring injury)

If the 17 players who did not play for two seasons after the hamstring injury were excluded from the analysis, mean age and BMI of remaining players were not significantly different (30.5 $\pm$ 4.0 years, and 27.0 $\pm$ 2.7, respectively). If the 17 players who did not play for two seasons after the hamstring injury were excluded from the analysis, there was no significant differences between the mean number of MLB game appearances before, during, and after the season of the hamstring injury ($0.090 < p < 0.420$), nor any significant differences in the number of official MLB at-bats before, during, and after the season of hamstring injury ($0.280 < p < 0.820$). However, for these 17 players, the mean number of game appearances and official at-bats during the season of hamstring injury and in each of the 2 previous seasons did demonstrate significantly lower totals than the other players ($p < 0.006$ across all parameters).

Discussion

To the author’s knowledge, this is the first descriptive study analysing hamstring injuries in MLB players. Because the incidence of hamstring injuries is more prevalent in position players¹, pitchers were excluded in the present study. The data shows that the length of stay on the DL is relatively short, with the typical MLB player spending only 15 days on the DL for most hamstring injuries. However, the data demonstrate that the number of MLB games played and official at-bats during the season of injury is significantly reduced. Furthermore, when all injured players are taken into account, the data shows that the reduced number of MLB games played and official at-bats appears to persist for the next two seasons after the injury. Certainly, there are numerous factors other than physical well-being that influence the number of
games played and the number of official at-bats taken throughout a MLB season (e.g. manager’s decisions, in-game strategies, historical performance against specific opponents, other injuries, etc.). Similarly, there are non-physical factors that influence length of stay on the DL (e.g. performance of replacement player, clubhouse social and general managerial issues). However, the data shows that nine out of 58 players (15.5%) did not play another MLB season following the season with hamstring injury, and that another eight players only played one more MLB season following the season with hamstring injury, for a total of 17 players (29.3%) who were out of MLB by two seasons after hamstring injury.

Only one player demographic variable was associated with the incidence of hamstring injury. The average age of the players who sustained a hamstring injury was 30.7 years older for a MLB player when considering the data of Witnauer et al. that suggests that a normal MLB career lasts until the age of 30 years. However, there was no correlation between age and length of stay on the DL or whether the player continued playing professional baseball after the hamstring injury. The BMI of the players who sustained a hamstring injury is not dissimilar to the average BMI of all MLB players. There was no correlation between BMI and length of stay on the DL or whether the player continued playing professional baseball after the hamstring injury. Hand dominance was not predictive of injury incidence, length of stay on DL, or continuance of playing.

This study’s data show a seasonal timing for hamstring injuries. Spring training and the earliest months of the season had the highest incidence of hamstring injuries. In their epidemiology study of MLB injuries, Posner et al. observed the highest incidence rate across all injuries occurring in the first month of the season, with rates declining significantly as the season progressed. While the current study does not allow the determination of the reasons for seasonal timing of hamstring injuries, it is possible that during the first 2 months of the regular season, MLB players have relative inflexibility, muscle weakness, and fatigability that make them vulnerable to hamstring strains. In addition, the adjustment from a stable spring training environment, based in the warm climates of Arizona and Florida, to a more dynamic environment of the regular season (e.g. weather, temperature, game schedule, travel) may be a contributing factor to more injuries.

Also, this study’s data seem to suggest that the 17 players (i.e. 29%) who were out of MLB by two years after their hamstring injury were already on the decline in their career. While the mean age and BMI of this subset were the same as the other injured players, their pre-injury levels of performance (measured by MLB games played and official at-bats) were significantly lower than the other injured players during the two seasons leading up to the season of injury. Moreover, the lower statistics of these 17 players directly skew the calculations for games played and official at-bats during the season of injury and the following two seasons. The remaining players managed to maintain the same number of games and at-bats throughout their five seasons studied. Therefore a hamstring injury in a player on the decline seems to hasten the end of his career, while a player who is demonstrating more consistency in games played and at-bats prior to the injury may not suffer a significant decline in participation upon recovery. Further research is needed to determine what associated factors contribute to the injured players decline in performance and eventual retirement from MLB.

Limitations
This study has several limitations. First, although the data were collected from an official MLB source, it was done retrospectively. Another weakness of this study stems from the use of the disabled list as a source of injury data. Although the likelihood is low, there may have been an untold number of hamstring injuries that were not severe enough to require the baseball player to be placed on the DL. Players with minor injuries can miss up to two weeks of the season without being placed on the disabled list. Furthermore, length of stay on the DL cannot be used as a true measure of healing or “return to play,” as 56 of 58 of the injured players were taken off the DL after the first 15 days. Specific treatment modalities and rehabilitation regimens were not examined. Moreover, seasonality of these injuries was not analysed, such that players who were injured during the month of September may not be placed on the disabled list because of MLB rules permitting teams to...
expand their rosters to include 40 players. Finally, this study did not define a true incidence of hamstring injuries because the changing number of active players on MLB rosters during a season and the varying level of exposure to injury conditions in practice and games were not analysed. Despite these limitations, the present study is the first to examine hamstring injury patterns among MLB players and these data can provide guidance to medical staffs for players with this type of injury for their long term prognosis. Future efforts can associate injury surveillance and standardised assessments with rehabilitation and performance parameters.

Conclusion
Hamstring injuries mostly occur in older MLB position players. Most of the injuries occur earlier in the season, and time spent on the DL for these injuries are significant. Most of the players with hamstring injuries were able to return to a similar level of participation following injury. However, a subset of players does not always return to the same level. Specifically, if a hamstring injury occurs in a player with declining MLB games played and official at-bats over the two seasons leading up to the injury, his future career may be in jeopardy of ending after the injury. Further, the ultimate goal would be that the initiation of off-season and pre-season hamstring exercise programmes, particularly among older players, would reduce the incidence of hamstring injuries in MLB players.

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