Statistical Analysis Applied to Arm Injuries in Baseball Players

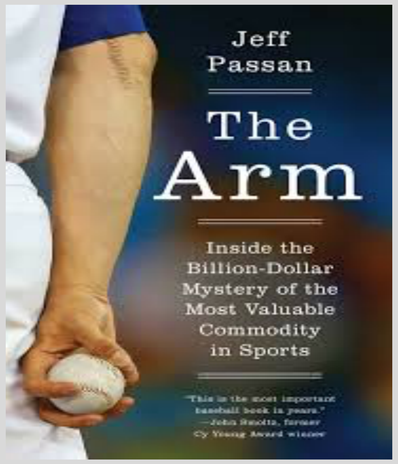
Jeremy Akioka[1], Niko Lillios[1], Ludovic Legrand[2], Jeong Choe[3]
Palo Alto High School[1], Hewlett Packard[2], Palo Alto Unified School District[3]

Research Question

How can statistics be used to understand injuries to baseball athletes?

I. History of Research

Injuries to pitchers and their arms have existed since the beginning of the game and continue to haunt young and experienced athletes. Many studies have been conducted to investigate the causes and measures of prevention related to these shoulder and elbow injuries. According to a study by Lindsey Barton Straus, there is approximately a fifty-fifty chance that a pitcher will experience elbow or shoulder pain in his career. In fact, an astonishing 58% of high school pitchers are said to have experienced a similar injury.

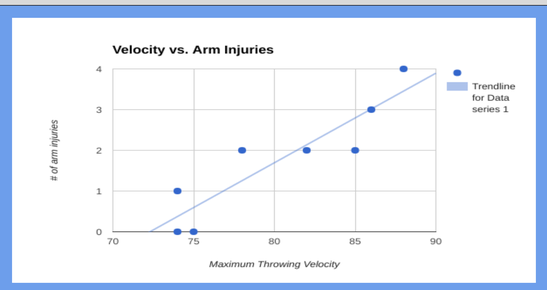


II. Who Cares?

Injuries are often assumed to be an inherent risk involved with playing a sport. However, it is hard to truly understand the significance of injuries without understanding the impact it can have on one's athletic career. Just last year one of my teammates on the Palo Alto Varsity Baseball Team suffered the worst injury a pitcher can experience; a torn UCL ligament. Injuries like these can come out of nowhere. One pitch you are fine and the next your entire career could be over. For many professional athletes, these injuries could mean the difference between superstardom and unemployment. All would agree that these injuries wouldn't exist in a perfect world which is why I think it is both relevant and important to further investigate these injuries.

III. Data Analysis and Results

Figure 1.1



In the graph above, we plotted pitch velocity vs. # of arm injuries suffered. When we plot the data in this fashion we see a clear positive correlation that suggests that higher velocity pitchers are more susceptible to arm injuries.

Key	
A	Ice Recovery
B	Private Training
C	Weight Training
M	More Than 1 Arm Injury

Figure 2.1

P(M|C)	0.750	P(M|C')	0.400
P(M|B)	0.400	P(M|B')	0.625
P(M|A)	0.6670	P(M|A')	0.500

Figure 2.2

Average Velocity	
C	C'
79.5 mph	77.2 mph

Figure 2.3

To further explore the effects of various factors in relation to baseball related arm injuries, we polled the sample on these three variables: ice therapy (Event A), weight training (Event B), private training (Event C). We found that those who have not used private pitching training in the last five years are approximately 1.6 times more likely to have sustained 2 or more baseball induced shoulder or elbow injuries.

Surprisingly, we also found that those who did not utilize weight training after pitching were less likely to have sustained 2 or more baseball related injuries (0.400) than those who don't weight train regularly (0.750). These results contradict studies that have shown weight training to be beneficial to arm health. However, we theorize that this disparity is due to the increased pitching velocity (2.3 mph) of athletes that take advantage of weight training as seen in Figure 2.3. As we concluded from Figure 1.1, a higher pitching velocity is strongly correlated to more arm injuries through one's career.

IV. Research Methodology

A. Population: The general population will include all baseball players. The sample population will be the Palo Alto High School baseball team.

B. Source of Data: Our main source of data will come from Palo Alto baseball athletes. Individual interviews and a team survey will allow us to compile the necessary data to complete our study.

C. How to Spot Trends: We will use our understanding of graphic displays to make trends more apparent and understandable. We will most likely utilize many line graphs and other quantitative variable graph types. We will collect a report from each player including biometrics such as age, height, and weight. Each report will also include information regarding usage such as previous injuries and individual time tables for previous injuries. Sport specific data could include position and style of play.

D. Data Collection: Through email, text message, and individual interviews, Paly baseball players discussed their histories with arm injuries. Feedback from these interviews as well as a program-wide survey makes up the bulk of our data. Next, the data was analyzed with the help of our mentor. Additional data will be collected via email surveys distributed within our baseball organization and those who have a history with the sport. Our survey includes multiple responses that cover biometrics and history of injury. Specific information regarding injury includes all previous baseball related injuries with their respective recovery time, and date for each specific injury.

E. Data Analysis We analyzed our data using graphical analyzation. This mostly includes causal data analysis because we are searching for factors that contribute to injury. We will determine if our data is significant if the deviation falls within our predicted range.

Special thanks to Ludovic Legrand, Dr. Choe, Ms. Launer, and Mr. Kolar for helping make this project possible.

Works Cited:

Damrow, Derek. "Musculoskeletal Injuries and Relared Biomechanics for Youth Baseball Pitching." *Journal of Musculoskeletal Research*, vol. 18, no. 2, pp. 1-8. *Advanced Plarc14ement Source*, doi:10.1142/S021895771530001X. Accessed 5 Nov. 2016.

Prugh, Jennifer. "Impact of psychosocial factors, pain, and functional limitations on throwing athletes who return to sport following elbow injuries: A case series." *EBSCO*, 1 Nov. 2012, eds.b.ebscohost.com.ez.pausd.org/eds/pdfviewer/pdfviewer?vid=8&sid=7333e3bb-231f-4dfaf22-7fee86edf471%40sessionmgr102&hid=119. Accessed 26 Oct. 2016.

Tiegen, Philip M. "Sore Arms and Selective Memories: Alexander H. P. Leuf and the Beginning of Baseball Medicine." *Journal of the History of Medicine and Allied Sciences*, vol. 50, no. No. 3, July 1995, pp. 391-408. *JSTOR*, www.jstor.org.ez.pausd.org/stable/24624189. Accessed 30 10 2016.

Wassinger, Craig A. "Reported Mechanisms of Shoulder Injury During the Baseball Throw." *Reported Mechanisms of Shoulder Injury During the Baseball Throw*, 1 Oct. 2011. *EBSCO*, eds.a.ebscohost.com.ez.pausd.org/eds/pdfviewer/pdfviewer?vid=3&sid=1a870f74-9bc9-49c5-9b6f-2f32c9dfcc57%40sessionmgr4008&hid=4111. Accessed 30 Oct. 2016.

Wasylynko, David. "Chronic Pain Due to Little Leaguer's Shoulder in an Adolescent Baseball Pitcher: A Case Report." *Journal of the Canadian Chiropractic Association*, vol. 59, no. 4, Dec. 2015, pp. 383-90. *Advanced Placement Source*, eds.a.ebscohost.com.ez.pausd.org/eds/pdfviewer/pdfviewer?vid=11&sid=669a0b80-1112-4e1e-bc1a-f81c3bff0dd0%40sessionmgr4007&hid=4110. Accessed 6 Nov. 2016.