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Title: Decreased Shoulder External Rotation and Flexion are Greater Predictors of Injury than Internal Rotation Deficits: Analysis of 132 Pitcher-Seasons in Professional Baseball

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Objectives: There is a strong desire to identify modifiable risk factors for shoulder and elbow injuries in pitchers, that when corrected, have the potential to reduce injury burden. Although much attention has been paid to Glenohumeral Internal Rotation Deficits (GIRD), less is known about the value of other range of motion (ROM) deficits. Therefore, the purpose of this work was to determine the impact and predictive capacity of shoulder and elbow ROM on shoulder and elbow injuries in professional baseball pitchers.

Methods: Over the course of 6 seasons (2010 to 2015), a comprehensive, preseason assessment of ROM was performed on all pitchers (n=132 pitcher-seasons) invited to Major League Baseball (MLB) Spring Training Camp for a single MLB organization. Total range of motion (TROM) and deficits were also calculated. All non-traumatic shoulder and elbow injuries that resulted in at least one day out of play were identified. Using multivariate binomial logistic regression analysis to control for age, height, weight, and all other ROM measures, the factors associated with an increased risk of subsequent shoulder or elbow injury were identified.

Results: 53 shoulder (n=25) and elbow (n=28) injuries occurred during 132 pitcher-seasons. The most significant categorical risk factors associated with increased elbow injury rates included the presence of a shoulder ER deficit > 5° (OR 2.40; p=0.069) and shoulder flexion deficit > 5° (OR 2.83; p=0.042). For continuous variables, the most important factors included increasing shoulder ER deficit (OR 1.07, p=0.030), decreased shoulder flexion (OR 1.09, p=0.017), increased IR deficit (OR 1.04, p=0.068), weight (OR 1.10, p=0.012), and decreased shoulder ER (OR 1.06; p=0.076).

Conclusion: A number of preseason ROM parameters are independent risk factors for the development of shoulder and elbow injuries during the upcoming season. This is particularly true for shoulder ER and flexion deficits. Although prior work has supported the importance of reducing GIRD in professional pitchers, this study demonstrates that deficits in shoulder ER and flexion are more significant predictors of subsequent injury.