

## **The Effect of Intrinsic Musculoskeletal Characteristics on Shoulder Complex Injury in Collegiate Baseball and Softball Players**

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**Context:** Preventable shoulder complex injuries (SCI) are a persistent and principal health concern for collegiate baseball and softball athletes and the clinicians who care for them. Multiple epidemiological studies have been conducted in this population; however, there is a lack of prospective studies examining modifiable musculoskeletal risk factors for SCI. **Objective:** To prospectively identify intrinsic risk factors for SCI in collegiate baseball and softball players. **Design:** Prospective cohort study. **Setting:** Athletic Training Room **Participants:** Data were collected on thirteen collegiate baseball (age:19.7±0.9years, height:72.8±2.8in, mass:89.2±9.1kg) and ten collegiate softball (age:19.8±1.5years, height:65.1±1.9in, mass:69.8±11.9kg) players. All athletes were cleared for full participation and had no history of shoulder injury in the past month. **Interventions:** All tests were performed preseason. Strength assessments were performed bilaterally using isometric “make tests” (5 seconds) in standard grade 5 manual muscle testing positions using hand-held dynamometry. Muscles tested included: biceps, triceps, glenohumeral internal and external rotators (IR, ER), pectoralis major (upper, lower fibers), trapezius (upper, middle, lower), rhomboids, serratus anterior, and supraspinatus. Range of motion (ROM), flexibility, and postural variables included: glenohumeral IR and ER, pectoralis major flexibility, pectoralis minor length, posterior shoulder tightness (PST), and forward head (FHP) and forward shoulder posture (FSP). The average of three trials was used for analysis. Participants were followed for a single season for SCI as documented and reported by each team’s Certified Athletic Trainer. Mann-Whitney U tests were used to compare injured (Inj) and uninjured (NInj) athletes by sport. Statistical significance was set at  $p < 0.05$  *a priori*. **Main Outcome Measures:** Mean peak force normalized to body weight (%BW) for isometric strength measurements. Mean values in degrees for glenohumeral IR/ER rotation, PST, FHP and FSP. Mean values in millimeters were analyzed for pectoralis minor length. **Results:** Over the season, two baseball players (15%) and five softball players (50%) sustained a SCI, with all injuries except one sustained on the dominant shoulder. No athlete incurred more than one injury. All injuries reported were classified as overuse, with five sustained through a throwing mechanism and two the result of repetitively diving while fielding. No significant differences in strength were demonstrated between Inj and NInj groups in either team. Injured baseball players demonstrated significantly greater bilateral glenohumeral external rotation ROM (dominant ER: Inj=120°±1.9°; NInj=104°±10.7°;  $p=0.026$  and non-dominant ER: Inj=119°±3.7°; NInj=101°±6.6°;  $p=0.026$ ). However, Inj softball players demonstrated significantly greater dominant PST (Inj=119°±7.9; NInj=105°±4.9;  $p=0.032$ ) and less non-dominant pectoralis minor length (Inj=59.5mm±3.6mm; NInj=73mm±6.7mm;  $p=0.008$ ). **Conclusions:** Based on the findings of this study in a small cohort, SCI risk

factors may differ between baseball and softball. In addition, flexibility may be a better indicator of SCI risk than strength. Future research should explore if these results can be replicated with large sample size and other populations. **Word Count:** 449