Comparison of Two Different Stretching Interventions on Glenohumeral Range of Motion of Overhead Athletes

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The baseball throwing motion repetitively creates large forces on the shoulder and elbow as the arm dynamically moves through susceptible end-range positions. It has been well established in studies investigating shoulder range of motion (ROM) in baseball players that differences between arms, such as external rotation increases while internal rotation decreases in the dominant arm compared to the non-dominant arm. This adaptation is commonly known as glenohumeral internal rotation deficit (GIRD) which is the excessive loss of internal rotation in the glenohumeral joint compared to the opposite arm. Many retrospective studies have demonstrated relationships between a decrease in shoulder ROM and shoulder injuries, such as lateral tears and impingement syndrome. In collegiate baseball players, poor shoulder ROM increases the likelihood of experiencing overuse symptoms during the season. The question often asked by coaches is how to best improve shoulder ROM in players that have had prior problems with overuse injuries.

A recent systematic review of 10 randomized controlled trials attempting to improve GIRD and posterior shoulder tightness found that most stretching interventions were performed as single interventions, with use of the articles only utilizing passive stretching, four utilized active stretching, and only two articles compared passive to active stretching, with only four articles using control groups with no intervention. While passive and active stretching have been shown to improve shoulder ROM, athletes tend to perform more dynamic exercises immediately prior to competition. The use of dynamic exercises after a pitching session have been shown beneficial in restoring normal shoulder ROM in professional pitchers. Understanding the differences between dynamic and passive flexibility routines have on improving shoulder mobility within a single intervention is necessary for my coaches and athletes to choose appropriate exercises to efficiently increase shoulder mobility. The purpose of this research was to compare dynamic mobility (DM) exercises with passive stretching (PS) in the upper extremities to determine which strategy best improved glenohumeral ROM.

The objective of this project is to investigate differences in glenohumeral ROM as a result of two different stretching interventions. Participants underwent a dynamic mobility routine and a passive stretching routine, and a digital inclinometer was used to record glenohumeral internal rotation and external rotation. Measurements will be taken prior to intervention in both the left and right arms to identify any possible GIRD among the athletes that participated in this study. Immediately after one stretching intervention was completed, measurements were taken, and taken again in thirty minute intervals for up to 1 hour (4 total trials). Two separate days of measurements were taken, so that each participant could partake in the DM and PS interventions. The hypothesis is that there will be significant increases in shoulder ROM when examining the data prior to post-intervention. Results can be used to prevent re-injury in collegiate athletes.

**METHODS**

- Twenty-five male NCAA Division III collegiate baseball players, 4 NCAA Division III collegiate football players, and 7 NCAA division III collegiate softball players were recruited from Ohio Wesleyan University. Inclusion criteria required the participants to be listed on the active roster, and free of injury at the time of screening.
- Due to the difference in sample sizes, only the baseball team’s data was analyzed. Of this population, the primary positions of the participants enrolled were: pitchers (n=11), catchers (n=3), infielders (n=5), and outfielders (n=6). The academic year of the participants were: senior (n=1), junior (n=6), sophomore (n=9), and freshman (n=9).
- The testing was completed on two different days to ensure the athletes did not get fatigued and lead to skewed results. Also, measurements were taken at least two days after pitching in competition.
- Shoulder ROM was measured by digital inclinometer in the Ohio Wesleyan University exercise lab. Participants laid supine on a flat table and placed their elbow on a towel so that the arm was abducted 90 degrees and the elbow was flexed at 90 degrees.
- Participants were randomly assigned to either the Passive Stretch intervention or the Dynamic Mobility intervention. Many different muscles can influence shoulder mobility. The goal of this study was to improve shoulder ROM in a time-efficient manner, therefore only six exercises were chosen for each intervention. Many different muscles can influence shoulder mobility.
- The PS group held each stretch for 30 seconds, whereas the dynamic mobility group completed 10 repetitions of each exercise. Participants in both groups completed six consecutive exercises targeting areas believed to contribute most to improving shoulder ROM.
- The PS intervention included: Doorway Stretch, Flexion, Extension, Horizontal Abduction, Overhead Triceps, and Standing Internal Rotation. The DM intervention included: Flexion, Extension, Overhead Throw, Reverse Throw, Medium Scapular Throw, and Standing External Rotation.
- Measurements began in Spring of 2019. The teams participating in the study were in season, but measurements were taken at least two days after competition. Baseline measurements were taken prior to stretching in both the left and right arms. Immediately after completion of either intervention, shoulder ROM was re-measured.
- ROM was re-measured in thirty minute intervals for up to one hour after the stretching intervention was performed. This data was used to assess the longevity of the effects from the different stretching interventions.