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## Scapular Stabilizer Force Output Measurements in Collegiate Softball Players Over the Course of Fall, Non-traditional Season

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## ***Scapular Stabilizer Force Output Measurements in Collegiate Softball Players Over the Course of Fall, Non-traditional Season***

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### ***OBJECTIVE***

There are articles that look at the pitching kinematics and kinetics of the windmill pitch and found the forces generated at the shoulder in windmill pitching are similar to the stresses of an overhand pitching (Oliver, 2018 Werner, 2006). Many articles in the softball field also look at the biomechanics and hip strength of a windmill pitcher and how a decrease of hip strength can affect the biomechanics of the pitching motion (Oliver, 2019). Despite having an increase in softball research, there have not been studies conducted that focus solely on scapular stabilizer strength over the course of a season. This study aims to fill this gap in the literature by focusing solely on the strength of scapular stabilizer muscles (rhomboids major and minor, latissimus dorsi, lower and middle trapezius, and infraspinatus) in collegiate softball players of all positions over the course of a non-traditional, fall season.

### ***DESIGN AND SETTING***

This study was conducted in a controlled setting and was repeated measures design in which each subject served as their own control. All data collection was completed by the same investigator using the same hand-held dynamometer. Subjects participated in three different data collection sessions across the course of a Fall, non-traditional collegiate softball season. Scapular stabilizer strength and scores of the patient reported outcome known as the Disabilities of the Arm, Shoulder, and Hand (DASH) were measured over the course of a fall season.

### ***PARTICIPANTS***

The participants of the study were collegiate

softball players of all positions from a private, midwestern Division III NCAA institution. A total of 11 subjects completed all three data collection sessions. All subjects were right-hand dominant and played various positions. Participants were solicited for participation in the study through a team announcement prior to the start of the Fall season. No inducements or enticements were offered for participation in the study. Prior to participation in the study, all subjects signed an informed consent document. This study was approved by the University Institutional Review Board.

### ***INTERVENTION***

No specific intervention was implemented other than the factor of time for the Fall, non-traditional season.

### ***MAIN OUTCOME MEASUREMENT***

Force output measurements of the scapular stabilizers were taken at the beginning, the middle, and the end of the Fall, non-traditional softball season through the use of a hand-held dynamometer. Subjects were tested in the "Y" (lower trapezius), "T" (middle trapezius), "T with the thumb up" (infraspinatus), "Prone Row" (rhomboids major and minor), and "I" (latissimus dorsi). After the strength measures were completed, the participants filled out a DASH form. The scapular stabilizer force output measures and the DASH score were the dependent variables and the independent variable was the effect of time. Each subject had three recorded trials for force output in each muscle testing position at each point in the season. For analysis, the average of those three trials was calculated and used for all further analysis. In order to examine data, an explore procedure was

completed within SPSS to provide the investigators with descriptive statistics for each variable. All data points met the criteria to proceed with further parametric analysis and therefore a repeated measures ANOVA was used to examine each variable across the course of the season with this repeated measures analysis.

### **RESULTS**

There was a statistically significant difference between the baseline and mid-season force output measures for the “Y” position ( $p = 0.000$ ), “T” position ( $p < 0.001$ ), “T with thumb up” ( $p < 0.002$ ), and the “I” ( $p < 0.001$ ). There was a statistically significant difference between mid-season and end-of-season force output for “T with thumb up” ( $p < 0.000$ ), “T” ( $p < 0.000$ ), and “Y” ( $p < 0.011$ ). Between the beginning of the season measurements and the end-of-season measurements, all five scapular stabilization test positions were

found to have a statistically significant decrease in force output. There were no statistically significant differences in DASH scores between any of the three data collection periods.

### **CONCLUSION**

Scapular stabilizer force output in softball players decreased in all standard test positions from pre-season to post-season over the course of a Fall, non-traditional season. Four of the five positions had statistically significant decreases in force output measurement between pre-season and mid-season data collections. Three of the five standard positions had a statistically significant decrease on force output between the mid-season and post-season data collections. More studies need to be completed over the course of a full softball season measuring scapular stabilizer strength.

**KEY WORDS:** *Softball, Scapular Stabilizer Strength, Collegiate Athletes*