

# Sports Medicine & Movement Laboratory

School of Kinesiology, Auburn University

May 2018

## Pitching Mechanics and Pain History in Collegiate Softball Pitchers

Gretchen Oliver, Gabrielle Gilmer, Kenzie Friesen, Abigail Brittain, Adam Anz, Michael Goodlett,  
Jeff Dugas, and James Andrews

### ABSTRACT

**Background:** Limited data are available on pain history and pitching mechanics in fastpitch softball. Of the paucity of softball data available, none have attempted to examine pain history and pitching mechanics. Approximately 370 overuse injuries were reported in collegiate and high school fastpitch softball players from 2004-2009. Although these upper extremity injury rates are known, fastpitch softball has yet to regulate pitchers' volume of throwing with pitch counts or limited inning and consecutive game exposure.

**Purpose:** The purpose of this study was to investigate pitching mechanics and upper extremity pain in National Collegiate Athletic Association (NCAA) Division I softball pitchers. Specifically, the authors examined the differences between kinematics of the trunk, shoulder, and elbow of those with and without upper extremity pain.

**Study Design:** Prospective cohort study.

**Methods:** Fifty-five NCAA Division I softball pitchers ( $20.0 \pm 1.3$  yrs.;  $173.4 \pm 6.9$  cm;  $80.3 \pm 12.6$  kg;  $10.5 \pm 2.6$  yrs. of experience) were recruited to participate. Participants completed a pain history questionnaire and were grouped based on the 'yes'/no' response to the question, "Do you currently experience any pain/discomfort?". If 'no' was answered, participants were deemed pain free ( $19.9 \pm 1.4$  yrs;  $173.8 \pm 6.9$ cm;  $81.4 \pm 12.5$ kg;  $10.0 \pm 2.5$  yrs. of experience;  $n = 32$ ). If the answer was 'yes', they were to select the area of the body where they experienced pain. Participants answering 'yes' and selecting anything in the shoulder, elbow, forearm, area were designated to the pain group ( $20.0 \pm 1.3$  yrs;  $174.4 \pm 6.9$ cm;  $82.9 \pm 12.4$ kg;  $11.1 \pm 2.6$  yrs. of experience;  $n = 23$ ). Kinematic data were collected at 100 Hz using an electromagnetic tracking system. Participants performed three trials of the change up pitch. The pitching motion was defined by five events: (1) start of the pitching motion (when pitching arm was at  $90^\circ$  of forward flexion), (2) top of back swing (TOB), (3) foot contact (FC), (4) ball release (BR), and (5) follow through (FT)

**Results:** Mann Whitney U-tests were employed to examine the differences between the variables of interest in each group. Significant differences were revealed in shoulder horizontal abduction at FC and trunk lateral flexion at BR. Specifically, the pain group revealed significantly greater shoulder horizontal abduction at FC and significantly less trunk lateral flexion (towards the throwing arm) at BR.

**Conclusion:** This study suggests that pitchers with upper extremity pain display mechanical differences pitching the change-up when compared to those pitching pain free. These mechanical differences exhibited could be the results of many factors, however, it is known that inefficient proximal stability of the kinetic chain results in alteration of energy transfer to the more distal upper extremity and thus potentially predisposing pain.

***This abstract is a brief overview of a manuscript submitted for publication. The full manuscript will be sent to you once it is accepted for publication.***

Further information can be found at [www.sportsmedicineandmovement.com](http://www.sportsmedicineandmovement.com) as well as

<https://scholar.google.com/citations?user=ae6HxHgAAAAJ&hl=en>. Specific inquires can be send to [goliver@auburn.edu](mailto:goliver@auburn.edu) .

Thank you again for your participation in our research and we look forward to your further participation. Thank you!