Influence of Arm Path on Elbow Varus Torque in Professional Baseball Pitchers

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INTRODUCTION: Arm path, or the distance the hand travels from the glove to ball release, has become an increasingly discussed topic within the baseball community. Arm path is a combination of elbow flexion, shoulder external rotation, shoulder abduction, forearm pronation, and wrist flexion movements. Traditionally, pitchers have been taught to throw with a longer arm path during the first part of the pitching motion, which includes extending the throwing arm away from the body and delaying shoulder external rotation. Advocates of the shorter arm path have recently made a push to get pitchers to shorten up as it is thought that it results in a more efficient motion and this in turn may decrease injury risk. By shortening the arm path, the throwing arm is closer to the body in a more loaded position theoretically creating less torque on the elbow. However, there is a lack of published data to support either claim of the benefits of a shorter or longer arm path. The purpose of this study was to determine if there was a relationship between arm path and elbow varus torque in professional pitchers.

METHODS: Data from 285 professional pitchers were included in this study (189.9±5.9 cm, 95.1±9.8 kg). Pitchers were tested pitching 8-12 fastballs at 480 Hz using a 3D motion capture system (Motion Analysis Corp., Santa Rosa, CA). The fastest pitch from each pitcher was used in the analysis. Arm path was measured as the total path the hand marker traveled during the entire pitch. Arm path was also normalized as a percentage of arm length (%AL). The pitch was broken down into four time points: maximum knee height (MKH), foot contact (FC), maximum external rotation (MER), and ball release (BR). Linear regressions were calculated to evaluate the relationship between arm path and elbow varus torque at each time point. Significance was set at $p<0.05$.

RESULTS: There was no significant relationship between arm path and elbow varus torque (Figure 1). Arm path did not have a significant effect on elbow varus torque for MKH to BR ($r2=.04$, $p<0.001$), MKH to FC ($r2=.05$, $p<0.001$), and FC to BR ($r2=0.00$, $p=0.207$). Furthermore, there was no significant effect on elbow varus torque for MKH to BR, MKH to FC, and FC to BR when arm path was normalized by the pitcher's arm length ($r2=0.00$ $p=0.262$; $r2=0.02$ $p=0.018$; $r2=0.01$ $p=0.081$ respectively).

DISCUSSION AND CONCLUSION: Recent anecdotal trends towards a shorter arm path in pitchers does not alter elbow varus torque as compared to both average and longer arm paths in a sample of professional pitchers. None of the studied time periods within the pitching motion revealed correlations between elbow varus torque and shorter arm paths. This suggests that total distance travelled by the arm during the pitching motion may not be a significant risk factor for injury in professional level pitchers. However, it is possible that components of arm path (i.e. elbow flexion, shoulder rotation, and shoulder horizontal abduction) play a larger role in the influence on elbow varus torque than simply arm path. Future studies should investigate the combined effects of arm path and arm path's components on elbow varus torque.

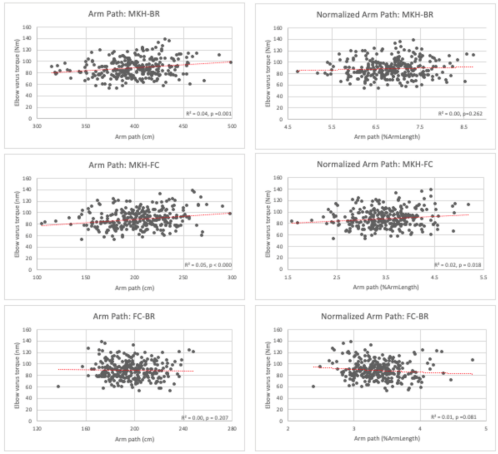

Figure 1. Correlations of arm path to elbow varus torque during a pitch. The left hand column measures arm path in centimeters and the right hand column uses arm path normalized to pitcher's arm length. There were no correlations in arm path to elbow varus torque. Maximum knee height, MKH; FC, foot contact; BR, ball release.