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### Upper Body Kinetics has No Difference for Mound and Flat Ground Throwing

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Baseball pitchers are required to have appropriate arm strength and pitching mechanics to perform well. There have been numerous studies on training programs in order to maximize their performance, yet no conclusions have been made for what would be ideal for these athletes. Many pitchers have been trained on flat ground without knowing benefits transfer to the mound or of possible detriments. **PURPOSE:** To determine if there are upper extremity kinetic differences of long tossing from a mound versus flat ground in experienced throwers. **METHODS:** Six healthy and experienced participants ( $20 \text{ Y} \pm 1.26$ ) were asked to make 5 throws from a mound (MO) and 5 throws from flat ground (FG). Thirty-eight markers were placed on the subjects at various anatomical locations to quantify the upper extremity kinetics using the infrared cameras of the motion capture system. The target was a distance of 67 meters, which was calculated using throwing angles and ball velocities. The dependent variables of elbow flexion torque, shoulder external rotation torque, shoulder abduction torque, and shoulder horizontal abduction torque were calculated and analyzed in PitchTrak. The data was then run through multiple dependent T-tests to compare the conditions of mound and flat ground pitching. **RESULTS:** There were no significant difference in mean was found among any of the variables: elbow flexion torque (FG= $11.90 \pm 0.69$  deg/sec vs MO= $13.80 \pm 1.30$  deg/sec), shoulder external rotation torque (FG= $8.56 \pm 0.33$  deg/sec vs MO= $8.63 \pm 0.36$  deg/sec), shoulder abduction torque (FG= $16.16 \pm 1.22$  deg/sec vs MO= $20.8 \pm 2.72$  deg/sec), shoulder horizontal abduction torque (FG= $11.50 \pm 1.42$  deg/sec vs MO= $12.76 \pm 1.37$  deg/sec). **CONCLUSION:** Upper body kinetics are similar in when throwing long toss from a mound and from flat ground. This indicates that there is no performance benefit of training from a mound compared to flat ground. This study provides some practical implications for coaching and training programs for baseball pitchers, allowing pitchers to have more flexibility when training to maximize performance.

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